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MANAGEMENT LOOKS AHEAD

- Management's Use of Time Study
- Measuring Productivity
- Work Measurement Control
- Management Effectiveness
- Cost Reduction through Personnel Administration
- Applying Statistical Cost Control

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CONTENTS

We Too Are Politicians 1
by Edward W. Jochim, President SAM 1952-1953

How Management Can Use Timestudy 2
by Phil Carroll, Professional Engineer

Procedure for Measuring Employee Productivity 6
by Martin Kriesberg, Marketing and Facilities, Research Branch, U. S. Department of Agriculture

Statistical Work Measurement Control 10
by Dr. Robert N. Lehrer, School of Industrial Engineering, Georgia Institute of Technology

A Management Effectiveness Index 12
by Eugene J. Benge, Management Engineer

A New Emphasis in Cost Reduction 16
by Allison V. MacCullough, Consultant, Organization Planning and Management Development

The Management Bookshelf 20

N M C International News 22

How To Apply Statistical Cost Control to Labor Costs 23
by John Evanko, Jr., Time-Study Engineer, Cost Estimator, Weston Electric Instrument Corporation

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We Too Are Politicians

By EDWARD W. JOCHIM
President, SAM, 1952-1953

IT HAS ALWAYS, and rightly so, been our policy to be non-partisan in politics. It has always, and again rightly so, been our policy to be Politic.

The odious connotations that have become attached to this noble word, Politic, have confused our understanding of its true meaning. Confused understanding can only lead to confused thinking and actions, or lack of actions. Actually, Webster defines Politic to mean: "Consisting of citizens; prudent and sagacious in devising and pursuing measures adapted to promote the public welfare." Citizen, on the other hand, is defined to mean one who enjoys freedom and full political privileges.

At the risk of being charged with over simplification, political activity may be regarded as the obligation and responsibility that goes with the freedom and liberty of the citizen. It is self-evident — history offers abundant proof that whenever citizens do not meet their proper political responsibilities, they lose their liberty and freedom.

True, we are professionals in management, or in the various specialized areas of management. Is not Public Administration but another specialized area of management? Who is better fitted than professional management to offer guidance and leadership to political actions? Who, in fact, has more to lose by the lack of competent management in politics?

Fortunately, other professional groups are showing reawakened awareness of these facts, as indicated by the following quotations from the Inaugural Address of Louis H. Bauer, M.D., President, American Medical Association.

"The medical profession, like other groups, has been remiss in the matter of voting, but we intend to set a pattern of good citizenship in registration and voting turnout.

"We physicians shall continue as active participants in the democratic process of our country . . .

" . . . politics is a dirty hands business, and physicians who belong to a clean hands profession should not enter it. How, I ask you, can politics be anything but dirty if those with clean hands stay out?"

No, this total group is not a pitiful, helpless numerical minority!

The 1950 census shows the overall figures are:

Farm Group	7,000,000
Wage Earning Group	20,000,000
Salaried and Professionals	28,000,000

Professionals and Management are about 12,000,000 of this last group.

This tremendously significant change has been taking place over the years, since the start of the Industrial Revolution, and this change is still continuing. Professional management installs a machine to replace the low earning, weary, back breaking drudgery of large groups of wage earners. Some of these replaced people are then trained to operate the machines, to perform the required technical service functions, and some of them and some of their children go on to design other such machines to continue the cycle. In 1900 there were five salaried people for each 100 wage earners in industry; today there are 23 for every 100.

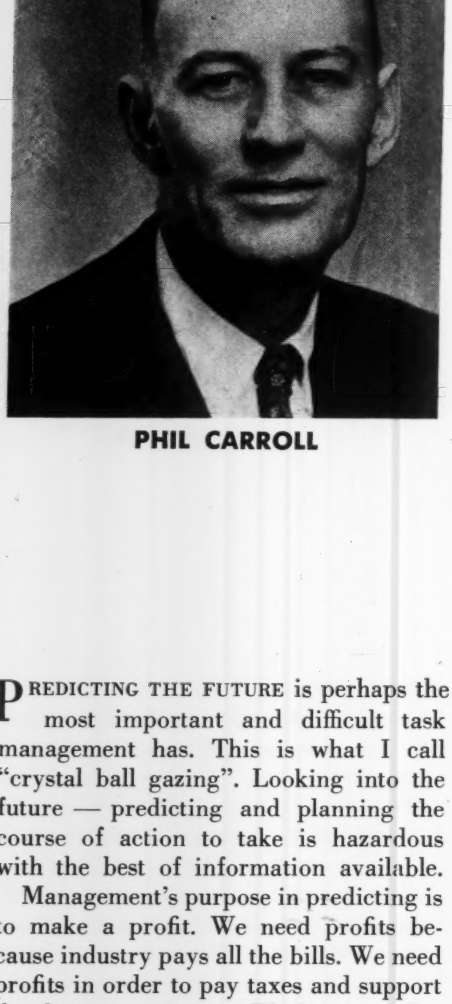
We have politic obligations and responsibilities; we are uniquely qualified to leadership in meeting these responsibilities; and we are a part of a very significant group numerically.

Certainly these facts demand that we devote a significant part of each chapter's program to analysis of government policy, organization and operation, local, state and national. As fundamental economics is basic in these matters, it may be well to start with, say, a Round Table Study of basic economics. Let's face up to these facts. Our technical college training and our specialization in areas of management are not conducive to the essential understanding of economic realities. After we have corrected this, we can begin to assume our proper role of guidance and leadership in politics.

We must carefully follow our non-partisan policy. There is nothing greater than our two political parties striving to out do each other in good results. Note that when one party is able to nominate a fine quality candidate, it almost always results in the opposition doing likewise. There is nothing as good as two great candidates running against each other, then instead of spiraling down, we are spiraling up.

Above all, we must now and forever more register and vote intelligently. We must, to the degree possible, prevail on others to register and vote intelligently.

And please send me the thoughts, comments and criticisms that occur to you as you read this, that we may all benefit from them.



PHIL CARROLL

How Management Can Use Timestudy

By PHIL CARROLL
Professional Engineer

Management is primarily concerned with the future. Mr. Carroll develops ways and means toward a profitable future that is essential for survival.

PREDICTING THE FUTURE is perhaps the most important and difficult task management has. This is what I call "crystal ball gazing". Looking into the future — predicting and planning the course of action to take is hazardous with the best of information available.

Management's purpose in predicting is to make a profit. We need profits because industry pays all the bills. We need profits in order to pay taxes and support the bureaucracies at Washington. Besides, management has the obligation to provide job security for the employees and themselves. Then of course, management needs to make a profit in order to pay the investors a fair return on their capital and provide the necessary capital to continue the successful operation of the industry.

To make profits legally, ethically and continue the success of the company, management needs to develop people to perpetuate the going industries. In my opinion, a successful organization cannot continue to progress without successful people coming along any more than it can without good equipment to replace the obsolete.

To accomplish these two objectives requires four basic ingredients:

1. High degree of skill
2. Good direction finders
3. Well laid plans
4. Meticulous follow-up.

TWO PROFITS

You recognize that there are two places to make a profit. One is before you get the order. This comes from selling your products at the right prices. The other is what you do after you get the order. Shall we say this profit depends upon how you control costs.

I know that analysis and study can markedly affect the income from price. I'm not thinking of selling prices as such. What I have in mind you might call the average selling price. Some refer to this as "selective selling".

Another factor that affects the average selling price is the thing we call order quantity. These two indicate ways for raising the profitability of the products you sell. I point them out as means of improving success where you sell products at a profit rather than simply selling dollars to raise volume.

On the other side, there is almost no part of cost where timestudy cannot be used with advantage. Timestudy is very useful whether your goal is to reduce costs or to increase productivity. The important difference between these two is in the proration of overhead. When you are expanding, increases in productivity can save the purchase of more plant and equipment. The effect on cost is substantial. Carl Snyder says, it is $10,000 per employee.[1]

To improve productivity, timestudy helps in several ways. Perhaps the most constructive is that it uncovers leaks. Good timestudy shows up the waiting time, the wasted and unnecessary work. The end results of timestudy are usually work standards. Most people use these in connection with what we call wage incentives.

I think incentives are necessary to get the results. If you use work standards without incentives, you get what we call "a fair day's work". With incentives you get more output from a given size of plant. We think in terms of 25 per cent incentive earnings. That corresponds with a 25 per cent bigger plant capacity. "That ain't hay," as we hear it expressed in everyday slang.

I think incentive is necessary for another reason. You may call it attitude, morale, or interest. We must have employees interested in doing things the way they are set up. Maybe I can show you what I mean by an illustration.

INCENTIVE FLY-WHEEL

Did you see the story in the Saturday Evening Post reporting what the produc-

[1]Snyder, Carl, "Capitalism The Creator".

tivity teams from Europe thought of our American methods? Some said, "The key to your American productivity is the housewife." She wants a bigger pay check. She has a list of wants as long as your arm. The implication was that the driving force behind our productivity was the wants of the average American family.

Incentive earnings fit in here. In general they average better than two 10-cent raises. But the point is that there is an interest in maintaining higher living standards. This acts as a fly-wheel on productivity.

This fly-wheel is most important in management predictions. It is effective whether we are quoting on a sales order or making a delivery promise. Its stabilizing effect is vital in estimating the prospects of success with a new product. It is essential in predicting the results from new methods and better process equipment.

Let me emphasize that work standards resulting from timestudy are only part of the results you desire. It is very important to know that those who work on standards will probably maintain their incentive performances. When you have this condition present, you can make many of your plans come true.

LOSS OF INCENTIVE

All this seems very constructive to me. You have read in the newspapers about the cartels in Europe. As I understand, the inference is of limited production. Such conditions could result from our progressive taxes. I fear that some business leaders may stop increasing their earnings because they can't keep any reasonable portion of them. They are poured down the drain in Washington. You must have seen the article in ADVANCED MANAGEMENT entitled "The Camel's Nose Is Under The Tent". Mr. C. E. Wilson makes this comment. "Independent of how he got there, the important point is that the camel of government control now has his nose under the tent of free competitive industry and is crowding in. We will all have to watch him or he will take over the tent, and we will lose our economic freedom and with it all our other liberties."

Have you seen "The Best Kept Secret In The Country"? It is a pamphlet put out by the Bureau of Business Practice in New London, Connecticut. It contains the kind of basic arithmetic that all your employees would profit from reading. On page 5 it points out that in 1929 "Federal spending amounted to less than two-thirds the income of the residents of California. In 1951 Federal spending was almost equal to the entire income of all states west of the Mississippi."

In Glen Gardiner's MANAGEMENT INFORMATION we find this. "For our current fiscal year, it's estimated that Federal expenditures will equal the total income payments of the Pacific and Mountain States plus North Dakota, South Dakota, Nebraska, Oklahoma, Texas, Minnesota, and nearly three-fourths of Missouri. Moreover, if total expenditures of state and local governments are added, the area would be extended to include the rest of Missouri, plus Arkansas, Louisiana, Kentucky, Tennessee, Mississippi, Alabama and two-thirds of Georgia."

You must have seen the READERS DIGEST article entitled, "In Washington It's Waste As Usual", July 1951. In there it is shown that the Federal debt in 1921 was $571 per family, in 1939 $1,165 per family and in 1950 $6,786 per family. I can't see how we can get any place by "sharing the wealth" and spending the heritage of our grandchildren.

I like to contrast with this approach the one used by Henry Ford. Early in his progress, his automobile sold for about $2,000. Then he determined to make a car for the multitude. He set out to produce an automobile for $500. Eventually he got the price down to $325.

WORK TO IMPROVE

My emphasis is that we should think more like he did. We should work to improve the standard of living. We cannot do it by running the printing presses faster. We cannot succeed by the Russian method of taking away from the haves to give to the have nots.

We cannot have more pie unless we increase the size of the pie. To me that means increasing productivity and lowering prices relatively. We can't get any place paying more money for the same production. The result is what you may have seen in TIME magazine for December 31, 1951. It noted there that a Sherman, Texas, department store had advertised $2.00 shirts for $3.00.

REDUCED COSTS

I think in terms of driving down the costs. I use timestudy results to help reduce management errors. These are what I call waste time and waste work. What we need more of are better controls and better methods.

I am not limiting my approach to the so called "direct labor". Our overhead or indirect is a virtually untapped gold mine. You often hear reference to the high cost of distribution. There is ample reason to mention it. But the same applies to office work, tool room, and maintenance operations.

There are practically no controls on these expenses. There are two reasons as I see them.

1. We don't know what work is supposed to be done.
2. We don't have any count on the work that is done.

We would be in a bad fix in the shop if the customer didn't tell us what the count was. He tells us how many pieces to make.

MEASURE INDIRECT

You may think that you control indirect expense by means of budgets. But how are budgets set? The experts say, "Get the department head to set the budget or at least approve it."

Can a department head measure himself correctly? Will he not be inclined to be comfortable and to add amounts for contingencies? What kind of a yardstick does he have for measuring his experiences? Only his past experience. The amounts that have been spent in the past include poor performance, optional trimmings, and useless details.

What change in output do you get when you put incentives on shop operations? Is there any reason to believe that you should not get the same results with indirect?

Most companies do not have any control on indirect labor. They do not know what work they should expect except vaguely. They do not know how long it should take to do the work.

It is laughable to think how naive some managements are. They think they can measure expenses in percentages of their sales dollars. I cannot think of a more misleading yardstick. Is material 30%, 40% and more? Is profit 10%, 20% or more? What proportions of this range of combinations are mixed in any

one period? Some use tons, labor dollars, and/or man hours. With any of these yardsticks, mixed products can throw out any comparisons made in terms of totals. These things are like comparisons of horses with apples.

PRODUCTIVITY YARDSTICK

But you can use timestudy standards to get reliable measures. Productive standards measure the work that you do in conversion. Conversion is manufacturing. Industrial plants are converters not brokers. Material that enters into your products is just the vehicle for carrying conversion.

Since most industries are made up of mixed products, you need a reliable yardstick and direction finder. For this purpose I suggest that timestudy standards will provide the only reliable common denominator.

You need reliable measures more for the indirect than for the direct. This may not ring true with you. But remember, you have a much better measure of product output. You know much more specifically what work is done in the shop.

WHAT PRODUCT OVERHEAD

You need measures of indirect labor to give you another direction finder. They help you to assign the correct overhead costs by products. You can find out where the profits and losses are.

Most of your costs are wrong. You figure direct labor and material to the fourth decimal place. Then you spread on the overhead with a shovel. Consequently, you make errors in cost that are often more than the margin of profit. Most people are only kidding themselves with their product costs.

Keep in mind that the overhead incorrectly applied to one product is not being applied to another. Both product costs are wrong. Both profits are wrong. So to me it is very important to get the overhead cost applied correctly. To do this, I would measure the indirect work that is done for each of the products. Then I would apply incentives to control their costs.

JOB SECURITY

We need to make a profit to progress and to stay ahead of competition. We need to make profits in order to buy new tools at our current double prices. Remember that our profits are badly inflated. We are charging depreciation costs at somewhere near the 1930 or 1940 prices. According to Ralph J. Kraut today's production facilities are 47 per cent obsolete. You may not be charging any depreciation cost if all of your tools are written off.

We need to make profits. Let me repeat, "Industry pays all the bills." We need to make a profit to provide job security for ourselves and our employees. According to Henry C. Link in his book THE WAY TO SECURITY, "The profit system, as developed in America, is a mathematical device for measuring the efficiency of the stewardship of a business."

HIGHLIGHTS ON THE AUTHOR

Phil Carroll, engineer, author, lecturer and counselor, has been an outstanding member of the Society for twelve years. He was presented the Gilbreth Medal for 1950 for his outstanding contributions to Work Measurement in the field of Industrial Engineering. He is the author of "Timestudy For Cost Control", "Timestudy Fundamentals For Foremen", and "How To Chart Timestudy Data".

We have an obligation to our employees and to our community. How can we pay pensions if we do not have the money?

Look at it the other way. People are not interested in productivity when they cannot tell if they will have a job tomorrow. If morale is low, your costs are high. The sheriff will soon be knocking at the door. You need the interest of your employees. We call it "motivation". You should have the active participation of those in the company working toward the success of your company. Your employees are the only people who can save it.

I think that incentive is vital. Incentive is what urges people to turn out work. People run machines, they don't run by themselves. People spend money —they are the only ones who can save it. You cannot get any better output than the people are willing to turn out. People respond to incentives. That's why I think it is the key to successful operations.

DEVELOP PEOPLE

This brings us to the element of leadership. We need more good leadership in order to develop the best there is in people. In his new book James F. Lincoln says, "Incentive management . . . is a means of giving the opportunity and the spur to the individual so that he will develop these abilities of his, now latent. It is obvious that the Creator in giving to man such abilities, expected them to be used." In another place Mr. Lincoln says, "The point that we usually miss is that millions of incipient leaders, some of whom would have been even greater than those we know, have gone to their graves as unknowns because they did not or would not face crises which would develop the latent abilities which would have made them leaders."

Paul Hoffman recently said, "Our society is organized to promote conditions which challenge the individual to realize his capacities." In HUMAN DESTINY DuNouy says the desire to excel is "the trait which above all others links man most clearly to the divine task of evolution." Henry C. Link puts it this way, "Personal security comes from habits and beliefs which the individual develops for himself and which make him self reliant under almost any circumstances."

We say that an organization is the lengthened shadow of the man at the top. The same applies in a degree to all supervisors. The influence of the boss is felt whether he be a vice president or a foreman. This is especially true of staff heads of indirect departments. They largely determine how the money will be spent. Their attitudes have an important bearing on the people under their direction.

Are these leaders good or poor? Are they capable or incapable? Do they know what their jobs are? Are they going places or drifting? Are they pointed to the goals of successful plant operation?

What are the benefits of all these executive development programs we hear so much about? How can we develop

junior executives if we don't know what they are supposed to do? How do we know they are developing if we don't know how well they do their jobs?

Sure there will be some improvement. It's a little like a college education. Is the student just getting himself a college degree or is he training himself for a profession?

DEFINE RESPONSIBILITIES

If we are going to develop men, I think we need definitions of the work to be done. We need:

1. Measurements of work.
2. Reports on the results.
3. Incentives to do better.

Without measurements, scorekeeping, and incentives it seems to me:

1. Many so called plans are actually only wishful hopes.
2. No follow-up that amounts to more than asking again.

When we ask, we do not know whether we are right or wrong. As a result, management is said to be "arbitrary". We lack the positive incentives to follow the plans laid out. We lack the prompt reporting of accomplishments. We lack the follow-up that you are sure to get when the failure of a subordinate costs your boss some incentive earnings.

NO CURE-ALL

Obviously, timestudy is not a cure-all. But it will bring out facts instead of opinions. It will supply the means of work measurement. It will show what the job is. It will point out where the cost leaks are. Timestudy will help to get the correct costs of your products. From these facts you can find out where your organization's energy is wasted. You can find out what parts of your operations and production are unprofitable. Also you can see what work performance is by individuals and departments. You can find out who is developing. Besides, I think that timestudy is the best training grounds we have in industry. The work itself is excellent from the standpoint of developing people to get things done.

Incentive is by no means a cure-all either. But it is a real help in getting better performance and productivity. If it is used progressively up and down the organization, it materially helps in maintaining follow-up of results.

Now we are back at our starting point. Let me repeat that planning and predicting is the major task of management as I see it. For sound planning, we need facts. I suggest that timestudy can supply the measure of the task to be performed.

But we know that to make plans and issue instructions is only the start. Someone must carry through. Here I would use incentives to control performance.

To continue successful operations—to maintain the stewardship as Link calls it, you must have capable people. You must develop people who are willing and able to work as a team for the success of your concern. Here I think that timestudy-incentive is the best available combination we have to measure capability and to reward performance.

TO EUROPE—EXPENSES PAID

National Management Council, the American affiliate of the International Committee for Scientific Management, is seeking top-level American executives to become members of five-man teams, each of which will conduct Management Seminar Meetings in a particular country of Europe during the fall of 1952.

The Seminars will be attended by groups of outstanding industrial leaders of the inviting country, thus affording unusual opportunity for interchange of ideas and experience. Discussions will cover Organization and Administration, Human Relations, Production Principles, Financial Control and Costs, Management Development, and Development of Markets.

Those selected will receive an honorarium, traveling expenses and living allowances.

If you are interested and can spare approximately six or eight weeks during September, October and November, please make your availability known to National Management Council, 501 Fifth Avenue, New York 17, New York, at once, so that your name can be placed in consideration.

Procedure For Measuring Employee Productivity

By MARTIN KRIESBERG

Marketing and Facilities, Research Branch,

U. S. Department of Agriculture

Marketing executives will find the principles set forth by Mr. Kriesberg worthy of careful study for possible application in their organization.

ONE OF THE primary tasks of scientific management is to develop methods for measuring the productivity of employees. This has value not only for studies on the relative efficiency of general production or marketing operations but also for the very practical purpose of increasing the productivity of people engaged in specific production and marketing tasks.

INITIAL STEPS

Measures of productivity are essential first steps in establishing standards of performance, which in turn, make possible effective systems of employee rewards and sanctions. Productivity measures are also necessary in comparing the efficiency of an operation between different groups of employees and between different periods of time. This permits management to recognize inefficient operations more readily and to note the effect of changes introduced to improve operations.

While much has been done in measuring productivity of factory workers, relatively little has been done to devise measures of productivity in other fields. This paper describes a procedure for measuring the productivity of one group of workers who have an important role in the distributive system, namely, delivery truck drivers. While the data with which the procedure has been developed were furnished by wholesale grocers, the same approach can be used in measuring the productivity of other kinds of delivery truck drivers and other kinds of operations as well.

Most measures of productivity are based upon standards developed from time studies. Usually, the time it takes to perform the various steps of an operation are clocked and a standard performance is established on the basis of elapsed time. In operations where measurable units of some kind are produced, productivity is frequently based on output per hour or work day. Motion and time studies may be used to help standardize operations and to assure comparability of work being rated. While the measure of productivity described in this paper is based on elapsed time (to cover a route), time studies are not utilized.

The author wishes to acknowledge the technical assistance of R. W. Hoecker and K. J. McCallister, Production and Marketing Administration, U. S. Department of Agriculture.

Moreover, since no two routes, and indeed no two trips are identical, no attempt is made to standardize operations.

PRINCIPAL VALUE

A principal value of this procedure is that it offers a measure of productivity, that is, industry and effectiveness, for operations which cannot be standardized and for which a count of units produced is not feasible. Existent operating procedures and actual time taken to complete the given task are used directly in establishing standards and measuring performance. Standards are developed by determining the variables which affect the amount of time taken to complete the given task. The relative weight which should be given each of these factors is determined by multiple correlation. Tables are then developed which permit comparison between actual time taken and the statistical estimate of the amount of time it should normally take to complete the task in which each of the variables is similarly operative.

FURTHER APPLICATION

A resume of steps taken in developing this procedure for drivers will indicate how this approach may be used to develop similar measures of productivity for other operators. First, on-the-job observations were made at numerous firms, and detailed data on truck operations were obtained from several. Second, on the basis of these observations and data, a "norm" or standard of performance for a unit of work was designated as the basis upon which actual productivity might be measured. The unit of work selected in this case was covering a delivery route and performance was to be measured by the time taken to cover a route with given characteristics. Third, the relationship between this work unit and a number of the variables affecting the time it would take to cover it was computed by multiple correlations. Of the factors considered, the combination of number of stops on the route, the dollar value of the orders and the distance traveled to make the deliveries proved to be the most practical. City and non-city miles were found to affect the measure of productivity in such a way as to suggest

separate treatment.[1] Fourth, on the basis of the relationship between each of the three variables mentioned and the time taken to cover the route, tables were drawn up from which standard performance could be computed for a route with a given number of stops and miles and a given load. Comparisons could then be made between the time actually taken to cover the route and the statistical estimate of the normal time that should have been taken. Separate tables were developed for city and non-city routes.

DEVELOPMENT OF TABLES

The tables were developed from the estimating equations which were computed to describe the relationship between the dependent variable (time on the route) and the three independent variables (number of stops, dollar value, and distance traveled).[2] A linear relationship was assumed to exist between the variables, and, accordingly, for each additional stop and for each added unit of dollar value and distance traveled, a fixed unit of time was added. The tables show the amount of time to be added for routes of a given number of stops, dollar value and miles traveled. The sum of the time units, together with a constant unit of time (which in the estimating equation is "a," essentially a time element common to all drivers unexplained by differences in the factors considered in this study) gives the total time that a given route should take, on the average.

TABLE I.

Estimating normal time for covering non-city routes.

Number of stops		*Distance covered*		*Value of orders*	
Number	*Hours and Minutes*	*Miles*	*Hours and Minutes*	*Dollars*	*Hours and Minutes*
		50-59	1:05		
6	0:57	60-69	1:18	600-699	0:37
7	1:05	70-79	1:31	700-799	0:44
8	1:13	80-89	1:45	800-899	0:50
9	1:21	90-99	1:59	900-999	0:57
10	1:29	100-109	2:12	1000-1099	1:03
11	1:37	110-119	2:24	1100-1199	1:09
12	1:45	120-129	2:37	1200-1299	1:15
13	1:54	130-139	2:51	1300-1399	1:21
14	2:02	140-149	3:03	1400-1499	1:27
15	2:10	150-159	3:17	1500-1599	1:33
16	2:18	160-169	3:30	1600-1699	1:39
17	2:26	170-179	3:43	1700-1799	1:46
18	2:34	180-189	3:57	1800-1899	1:52
19	2:42	190-199	4:09	1900-1999	1:59
20	2:51	200-209	4:22	2000-2099	2:05
21	2:59	210-219	4:36	2100-2199	2:12
22	3:07	220-229	4:49	2200-2299	2:18
23	3:15	230-239	5:03	2300-2399	2:24
24	3:24	240-249	5:15	2400-2499	2:30
25	3:31			2500-2599	2:36
26	3:39			2600-2699	2:42
27	3:48			2700-2799	2:48
28	3:56			2800-2899	2:54
29	4:04			2900-2999	3:01

Constant to be added is 3:02

EXAMPLE:

The driver makes 19 stops, travels 152 miles and delivers $1,809 of groceries. Add 2:42 plus 3:17 plus 1:52; this comes to 7 hours, 51 minutes. Then add the constant factor of 3:02 for a total of 10:53. The driver should normally have covered the route in about 11 hours.

VARIABILITY

Of course, the variables included in the table do not account for all the variability among drivers in time required to complete their routes.[3] Other factors such as type of truck, number of items on the truck, traffic detours, weather, etc., affect the time taken to deliver orders. However, these other factors are of lesser importance, though management may take them into account when explanations of low productivity are required.

FORMAT OF TABLES

The format of tables used to compute the normal time it should take a driver to cover routes of a given number of stops and miles with a given load is shown on the following pages. The estimating tables shown are based on records of one wholesale grocer and therefore probably would not apply to other wholesalers. In using this procedure, each firm should, of course, develop estimating tables on the basis of its own records. As suggested above, this is done by setting down in tabular form the daily records of individual operators over a period of time such as 30 - 60 days. In the case of delivery truck drivers, the data are entered under the following heads: The amount of time spent on the route each day, the number of miles driven each day, the dollar value of orders delivered and the number of stops (deliveries) made each day. It will be noted that these heads are the variables

[1] Holding the other two variables constant, the amount of correlation between time on the route and each of the independent variables in this example was as follows: Number of stops, .430 (city routes) and .240 (non-city routes); dollar value, .225 (city) and .161 (non-city); miles traveled, .025 (city) and .404 (non-city). Comparable correlations were obtained from a second firm's records.

[2] In this example, the equation for city routes was: $X_1 = 3.052 + .0132 + .0098 + .1587$ with a σ of 1.30 or 1 hour 20 minutes on total route time; for non-city routes it was $X_1 = 3.044 + .0104 + .0217 + .1347$ with a σ of 1.25 or 1 hour 15 minutes.

[3] The three variables, number of stops, dollar value, and distance traveled account for approximately 65 percent of the differences between drivers for both city and non-city routes.

with which we have been concerned in this example. From the data thus assembled, values for each of the variables, i.e., for each part of the estimating equation, are obtained by multiple correlation.

NORMAL TIME

Normal time is computed from the tables (using the table for non-city routes in this example) as follows: The hour figure for number of stops made which corresponds to the number of stops on the route, is found in the column for number of stops, e.g., if driver J. R. makes 17 stops, the time is 2:26 (2 hours and 26 minutes). Similarly, the hour figure which most nearly approximates the mileage and the value of the orders delivered is taken. For example, if the driver traveled 171 miles, the time is taken from the column for distance covered opposite 170-179 and is 3:43. If the driver delivered $1,740 of groceries, the hour figure is taken from the column for value of orders opposite 1700-1799 and is 1:46. These hour and minute figures are added together to represent the time explained by the three factors (stops, distance and value of orders). In this example, the time would be 6 hours and 115 minutes or 7:55. We then add a constant of 3:02 hours to represent factors other than the three mentioned which affect the time it will take to cover a given route.[4] Accordingly, driver J. R. should normally have taken 10:57 or about 11 hours to cover the route. Additional examples of how normal time is computed are given at the bottom of the tables.

TABLE 2.

Estimating normal time for covering city routes.

Number of stops		*Distance covered*		*Value of orders*	
Number	*Hours and Minutes*	*Miles*	*Hours and Minutes*	*Dollars*	*Hours and Minutes*
5	0:48	5-9	0:03	500-599	0:39
6	0:57	10-14	0:06	600-699	0:47
7	1:06	15-19	0:09	700-799	0:55
8	1:16	20-24	0:12	800-899	1:03
9	1:26	25-29	0:15	900-999	1:11
10	1:36	30-34	0:18	1000-1099	1:19
11	1:45	35-39	0:21	1100-1199	1:27
12	1:54	40-44	0:24	1200-1299	1:35
13	2:04	45-49	0:27	1300-1399	1:43
14	2:14	50-54	0:30	1400-1499	1:51
15	2:24	55-59	0:33	1500-1599	1:59
16	2:33	60-64	0:36	1600-1699	2:07
17	2:42	65-69	0:39	1700-1799	2:15
18	2:52	70-74	0:42	1800-1899	2:23
19	3:02	75-79	0:45	1900-1999	2:31
20	3:11			2000-2099	2:39
21	3:20			2100-2199	2:47
22	3:30			2200-2299	2:55
23	3:40			2300-2399	3:03
24	3:49			2400-2499	3:11
25	3:58			2500-2599	3:19
26	4:08			2600-2699	3:27
27	4:18			2700-2799	3:35
28	4:28			2800-2899	3:43
29	4:37			2900-2999	3:51
30	4:46			3000-3099	3:59
31	4:54				
32	5:03				
33	5:12				
34	5:21				
35	5:30				

Constant to be added is 3:04

EXAMPLE:

The driver makes 22 stops, travels 57 miles and delivers $1,950 of groceries. Add 3:30, 0:33 and 2:31. This comes to 6 hours and 34 minutes. Then add the constant of 3:04 for a total of 9:38. The driver should normally cover the route in about 9½ hours.

In this example, differences of less than 1¼ hours (since the σ is 1:15) may be due to factors mentioned above which are not taken into account by this procedure. However, when a driver's actual time is frequently more than 1¼ hours above normal time and whenever actual time is more than 2½ hours above normal time, an explanation should be required. For very long routes or those with especially heavy loads or a very large number of stops, differences somewhat greater than the above may be anticipated.

ADOPTION OF PLAN

The procedure outlined here has been adopted by several wholesale grocery firms and reports indicate that it has proved to be effective. The standards represent realistic goals since they are based on past performance of the group of employees to be rated. However, because they are based on past performance, a periodic review is necessary to see if they need to be raised or lowered to meet current performance possibilities.

This method of evaluating employee productivity, i.e., industry and effectiveness, is especially applicable where time studies are not feasible and where precise measurement is not necessary. Thus, it probably would be useful in evaluating the performance of milk and laundry route drivers, office building charwomen or factory maintenance men, and warehouse order assembly men. In such occupations, employees are not often paid on the basis of units of work done. Accordingly, while some means of encouraging industry and evaluating performance are desirable, precise measures of productivity are not necessary. The procedure described here is a ready way of evaluating performance without recourse to time studies.

[4] The figure 3:02 is derived from "a" of the estimating equation ($Xc_{1.234} = a_{1.234} + b_{12.34}X_2 + b_{13.24}X_3 + b_{14.23}X_4$); it is the amount of time common to all routes covered (which were included in this study). In this example "a" was 3:04 (3 and 04/100 hours) or approximately 3 hours and 2 minutes.

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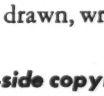

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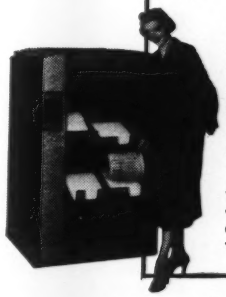

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OFFICES IN PRINCIPAL CITIES

Statistical Work Measurement Control

By DR. ROBERT N. LEHRER
School of Industrial Engineering,
Georgia Institute of Technology

In this article Dr. Lehrer provides management with new and more precise tools for control.

THE BASIC PHILOSOPHY so important to Statistical Quality Control has been well stated by Grant[1] as follows:

> Measured quality of manufactured product is always subject to a certain amount of variation as a result of chance. Some stable "system of chance causes" is inherent in any particular scheme of production and inspection. Variation within this stable pattern is inevitable. The reason for variation outside this stable pattern may be discovered and corrected.

This basic philosophy is translated into Statistical Quality Control by quantity and quality determination and statistical evaluation. Production is "measured", compared with predetermined specifications, and the results are analyzed by use of Shewhart Charts and other statistical techniques. This same general procedure can be applied to the control of worker rate of production and work standards.

The above quoted basic SQC philosophy can be restated with minor changes as the basic philosophy of Statistical Work Measurement Control.

Measured *quantity of production* is always subject to a certain amount of variation as a result of chance. Some stable "system of chance causes" is inherent in any particular scheme of production and *evaluation.* Variation within this pattern is inevitable. The reason for variation outside this stable pattern may be discovered and corrected.

This basic philosophy can be translated into Statistical Work Measurement Control (SWMC) by quantity and quality determination and statistical evaluation. Production is "measured" in units of accomplishment or non-accomplishment, compared with "standard" production, and the results are analyzed by use of Shewhart Charts and other statistical techniques. Just as with SQC, SWMC allows identification of assignable causes and the instigation of corrective action to remove their influence from the pattern of variation.

SWMC makes possible the detection of extreme variations in rate of production or productivity, and allows concentration of effort on correction of conditions causing these extreme variations. Progressive elimination of assignable causes will allow better utilization of industrial facilities and eventually a stable pattern of variation indicative of the presence of a true "system of chance causes" will become evident.

Dr. Lehrer, who has been a member of SAM since 1947, delivered this address to the Georgia Section of the American Society of Quality Control in Atlanta, Ga.

[1] E. L. Grant, *Statistical Quality Control,* 1946, McGraw-Hill Book Company, Inc., New York.

The objectives of SWMC are:

1. To improve the accuracy and consistency of production standards.
2. To isolate, identify and control causes of excessive production variation.
3. To continually increase the rate of productivity by elimination of deleterious factors and provision of favorable conditions.

It must be recognized that there are certain basic differences between SQC and SWMC. The most significant is the basis of evaluation. SQC makes use of tangible and normally accurate standards of evaluation, while SWMC is of necessity forced to utilize production standards of doubtful and unknown accuracy. These standards may be based on past performance records (which have no known relationship with the "correct" rate of production, and only indicate what had been at one time), estimation (usually guesstimated by rule-of-thumb), or time study and standard data (which are also subject to some error), which at best only indicate the rate of productivity that should be obtained to a limited degree of accuracy.

CORRECTION OF STANDARDS

SWMC is the only tool that allows evaluation of the correctness of production standards. Inaccurate and inconsistent work standards can be detected by SWMC when other evaluation techniques fail to detect irregularities. Errors are extremely difficult to isolate by conventional procedures, for "loose" standards are covered up by most employee groups while "tight" standards are loosened, and thus the net result is a low level of productivity, due in part to poor standards, but which can not be identified as such.

Variability in productivity as encountered in SWMC can be classified as arising from three sources. These are:

1. *Variability due to inaccuracy and/or inconsistency of production standards.* These errors may be due to weaknesses in the methods used for determination of production standards, such as poor time study theory procedure or policy, change in method of job performance from the standard method upon which the production standard was established, actual shop conditions differing from the assumed conditions, poor control of production facilities, variations in materials being processed,

incorrect tools and equipment, ineffective work assignments, etc. All of these causative factors may be controlled when they are isolated and identified.

2. *Variability due to differences in workmen.* These variations are caused by individual differences, for no two individuals are identical. Therefore, we should expect workers to produce at different levels of productivity due to their differences in ability, skill, aptitude, attitude, application and so forth. We do not want to require all individuals to attain the same standard, but to produce to the maximum of their ability. We do want to remove some of the difference by providing proper training and motivation.

3. *Variability in productivity of individuals from time to time.* These variations are caused by inconsistent application of individual effort due to non-uniform motivation, differences in skill on various tasks, poor attitude, etc.

These three sources of variability are individually multi-variate systems, perhaps made up largely of normal univariate systems. Statistical analysis provides the key to identification of assignable causes of excessive variation and the eventual identification and control of the causative factor.

APPLICATIONS

A few general examples of SWMC application should serve to illustrate how this technique can be used. SWMC makes use of the standard SQC procedures and techniques with little modification. Control charts resulting from a broad type of investigation will lead to more detailed investigations. Out-of-control points will indicate that further "sleuthing" should be done, the data should be further subdivided, additional data should be gathered, and a more detailed analysis should be made in order to properly identify assignable causes and to control them. The effects of one or more of the components of the three main multi-variate contributory systems are equalized or eliminated by detailed analysis.

Standard Cost Analysis. Most standard cost systems utilize a comparison of actual costs with standard costs for a cost center for a pay period. Plus variances (standard costs less than actual costs) are regarded as indicative of poor performance by the cost center, and minus variances (standard costs more than actual costs) as indicative of good performance. Usually, evaluation is done on a subjective basis without consideration of the normal range of variances. Statistical analysis of standard cost data with the aid of X-Bar and R. Charts allows interpretation of the variances relative to normal or expected ranges, and the identification of quantitative values that represent changing conditions. Out-of-control points could be caused by a change in production volume that has not been compensated for in the standard cost values, failure of the cost distribution system to accurately apportion costs, poor performance by the operative personnel in the cost center, poor or ineffective supervision, incorrect production standards, or a number of other things. Detailed analysis would be required in order to isolate the cause of the trouble.

Overall Worker Productivity Analysis. An investigation of the productivity of the entire worker group, utilizing an X-Bar and R Chart showing the average productivity of the group and the range from best to poorest performers, would indicate changes in the general level of effectiveness of plant operation. Out-of-control points could indicate seasonal influences, variation in supervisory effectiveness, industrial unrest, social reaction, etc. Trends could be predicted, and reinforced if favorable or headed-off if unfavorable in order to stabilize productivity at a high level.

Individual Worker Productivity Analysis. An investigation of the productivity of individual workers, utilizing a chart for individual measurements, would furnish information about variations in productivity due to individual differences, inconsistency of production standards from job to job, changes in productivity due to physiological and psychological cycles, need for training and additional supervision, etc.

Department or Crew Productivity Analysis. An investigation of productivity of groups of workers, utilizing X-Bar and R Charts, would indicate differences in conditions of work and supervision from one section to another, differences in composition of groups, inconsistency of production standards, etc.

Analysis of Productivity by Class or Type of Work. An investigation of productivity on various classes or types of work, again utilizing X-Bar and R Charts, would allow identification of factors influencing productivity due to work conditions, equipment conditions, inconsistency of production standards, inadequacy of allowances, effectiveness of supervision, etc.

Analysis of Individual Productivity During Daily Work Periods. An investigation of individual productivity within the work period would yield information on worker motivation, accuracy of various production standards, adequacy of fatigue allowances, influence of rest pauses, etc.

Machine Utilization Studies. An analysis of productive and non-productive machine times, tended individually or collectively with other equipment, would highlight variations due to lack of materials, irregularity of machine cycles, machine interference, operator interference, supervisory interruptions, etc. These data might furnish a basis for more adequate time study allowances with a resultant increase in the accuracy of the production standards.

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tells how on Page 9

A Management Effectiveness Index

By EUGENE J. BENGE

Management Engineer

Executives have become accustomed to various indices of business conditions. Here is a method of preparing a management effectiveness index which can be adapted to most any company which has been operating for ten years or longer.

"WHEN IT GOES DOWN, I'll raise Hell — when it goes up, I'll go fishing. That's the kind of index I want," said the president of a medium sized manufacturing company. "And," he added, "when it goes down, I want to know why."

An interesting assignment. This article selects from the study the different problems encountered, states the principles followed, sets forth the exact procedures so that the plan can be adapted to a great many types of industrial and commercial organization.

DIAGNOSTIC FACTORS

Under the plan, a half dozen or more separate and significant factors are selected as barometers of management. For example:

1. How successful is the company compared with others in its industry?
2. How able is financial management?
3. How able is sales management?
4. How able is manufacturing management?
5. How able is purchasing management?
6. What is the trend of net profits after taxes?

If indices measuring these six diagnostic trends are rising, it is accepted that management effectiveness as a whole is rising.

Most of these are, in turn, capable of subdivision. For example, the manufacturing index might be a composite of trends like the following:

a. Direct labor payroll per supervisory payroll dollar
b. Labor efficiency under the existing wage incentive plan
c. % machine operating time compared with possible

If these three indices are rising, it is accepted that manufacturing efficiency as a whole is rising. Hence if the three can in some way be combined, an index of manufacturing efficiency can be developed. Then similar indices of the other five major factors (industry comparison, finance, sales, purchasing and profits) can be joined to yield a total management index.

The vice president in charge of manufacturing may well have in his office three charts (payroll ratio, labor efficiency, machine operating time) plus the composite chart, which is the index of manufacturing efficiency. This index, in turn, becomes one of the six charts contributing to the management effectiveness index chart maintained by the president.

In analyzing the problem of combining various factors, we evolved a few basic principles:

PRINCIPLES

1. Data should be available monthly.
2. All data should be so expressed that an increase is favorable.
3. Data of one index should overlap as little as possible with those of other indices.
4. Available records should be utilized wherever possible.
5. Factors should be weighted by executive judgment.
6. Cognizance must be taken of long term trends (such as the rise of commodity prices underlying investments in inventory).
7. Ratios (where used) must be computed *after* allowance for break-even points. Example: in a given month, company profits are $100,000 on a million dollars of sales — seemingly a ratio of 10%. But $200,000 of sales are needed before profits start, so actually $100,000 profits were earned on $800,000 sales above the breakeven point, or 12½%. If company sales fell to $500,000, with profits of $50,000, it would seem that the 10% figure was being maintained. Actually, the $50,000 profits came from the $300,000 over the break-even point, a rate of 16.7%. Per contra if $1,500,000 of sales yielded $150,000 profits the fact is that these profits came from $1,300,000 of sales, a rate of 11.5% above break-even.

Invariably this principle stirs up a hornet's nest of discussion.

COMBINING INDICES

There are several possible ways to composite or combine indices dealing with different factors, involving large and small numbers, large and small variations, underlying trends, original figures, ratios between two figures, percentages of totals and percentages above and below a trend or mid-point. The method here employed is to convert all data into terms of a unit known as the "standard deviation". Two simple examples will show how this figure is computed:

$ SALES (in millions)

	Sales	Deviation	D^2	Deviations expressed in S.D.'s
1942	13	—4	16	—1.32
1943	16	—1	1	— .33
1944	15	—2	4	— .66
1945	15	—2	4	— .66
1946	14	—3	9	— .99
1947	18	+1	1	+ .33
1948	23	+6	36	+1.98
1949	17	0	0	0
1950	18	+1	1	+ .33
1951	21	+4	16	+1.32
Total	170		88	
Aver.	17		88	
Square Root (value of 1.00 S.D.)				3 million dollars
Value of 1 unit of deviation				.33 (1 million equals .33 S.D.)

INDUSTRY RATIO
(100 means equal to average of industry)

Ratio	Deviation	D^2	Deviations expressed in S.D.'s
85	— 1	1	— .08
88	+ 2	4	+ .16
74	—12	144	— .96
79	— 7	49	— .56
80	— 6	36	— .48
115	+29	841	+2.32
92	+ 6	36	+ .48
100	+14	196	+1.12
68	—18	324	—1.44
79	— 7	49	— .56
860		1680	
86		163	

13 points of ratio
.08
(1 point deviation equals .08 S.D.)

The mathematical procedure is:

1. Compute the average of the original figures.

2. Enter the plus or minus deviation of each entry from the average.

3. Square each deviation; total, divide by the number of cases; take the square root of the result. This figure is the value of a standard deviation (1.00 S.D.). In our first example above, 1.00 S.D. equals $3,000,000.

4. Compute the reciprocal, to get the S.D. value of one unit of the original data. In our first example above $1 million equals .33 S.D.

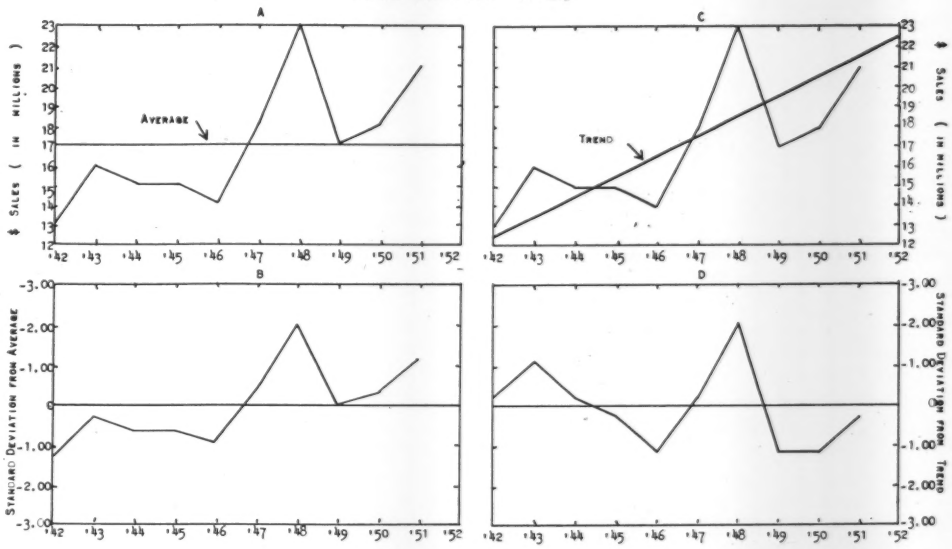
5. Multiply this last figure by the entries in the "deviation" column to get S.D. values (+ or —) which can be substituted for the original figures, and can be used in plotting charts like Chart B in Figure 1.

The S.D. (standard deviation) is a unit for measuring deviation from the average, which unit is derived from its own series of figures. Because of this fact, a series involving large numbers, or large variations, can be compared with another series involving small numbers or small variations. In either case, the translated figures will probably be between +3.00 S.D. and —3.00 S.D.

But the sales figures above show a distinct upward trend, suggesting price inflation. The figures of recent years (higher price years) look good (plus signs). Those of the earlier years look bad (minus signs). If we establish the trend by smoothing the sales curve, the picture changes radically.

If this more accurate method is followed, management will not be so complacent about the 1949-50-51 sales picture as might be the case under the com-

Figure 1
COMPANY SALES
1942 to 1951 INC.



putation method previously shown. This is not the "sales index" but is one of three factors which in composite make up the sales index.

Figure 1 shows sales data:

a. As normally plotted.
b. Expressed in S.D. units above and below average (wrong method).
c. As normally plotted, with trend.
d. Expressed in S.D. units above and below the trend (right method).

We have here demonstrated how a series of raw data can be expressed in terms of its own standard deviation above and below its average (or its trend). For purposes of simplicity, annual figures have been used, and computations expressed largely in whole numbers. In practice, monthly figures and decimals should be observed.

The computation of the final management index is relatively simple.

Assume that top management had agreed to weight the six factors as follows:

Industry comparison index		1
Finance	"	1
Sales	"	2
Manufacturing	"	2
Purchasing	"	1
Profit	"	3

SALES (IN MILLIONS)

	Sales	Trend	Deviation from Trend	D^2	Deviations expressed in S.D.
1942	13	12.5	+ .5	.25	+ .225
1943	16	13.5	+2.5	6.25	+1.125
1944	15	14.5	+ .5	.25	+ .225
1945	15	15.5	— .5	.25	— .225
1946	14	16.5	—2.5	6.25	—1:125
1947	18	17.5	+ .5	.25	+ .225
1948	23	18.5	+4.5	20.25	+2.025
1949	17	19.5	—2.5	6.25	—1.125
1950	18	20.5	—2.5	6.25	—1.125
1951	21	21.5	— .5	.25	— .225
Total				46.50	
Average				4.65	
Square Root (Value of 1.00 S.D.)				2.2 million dollars	
Value of 1 unit of deviation				.45	
				($1 million deviation equals .45 S.D.)	

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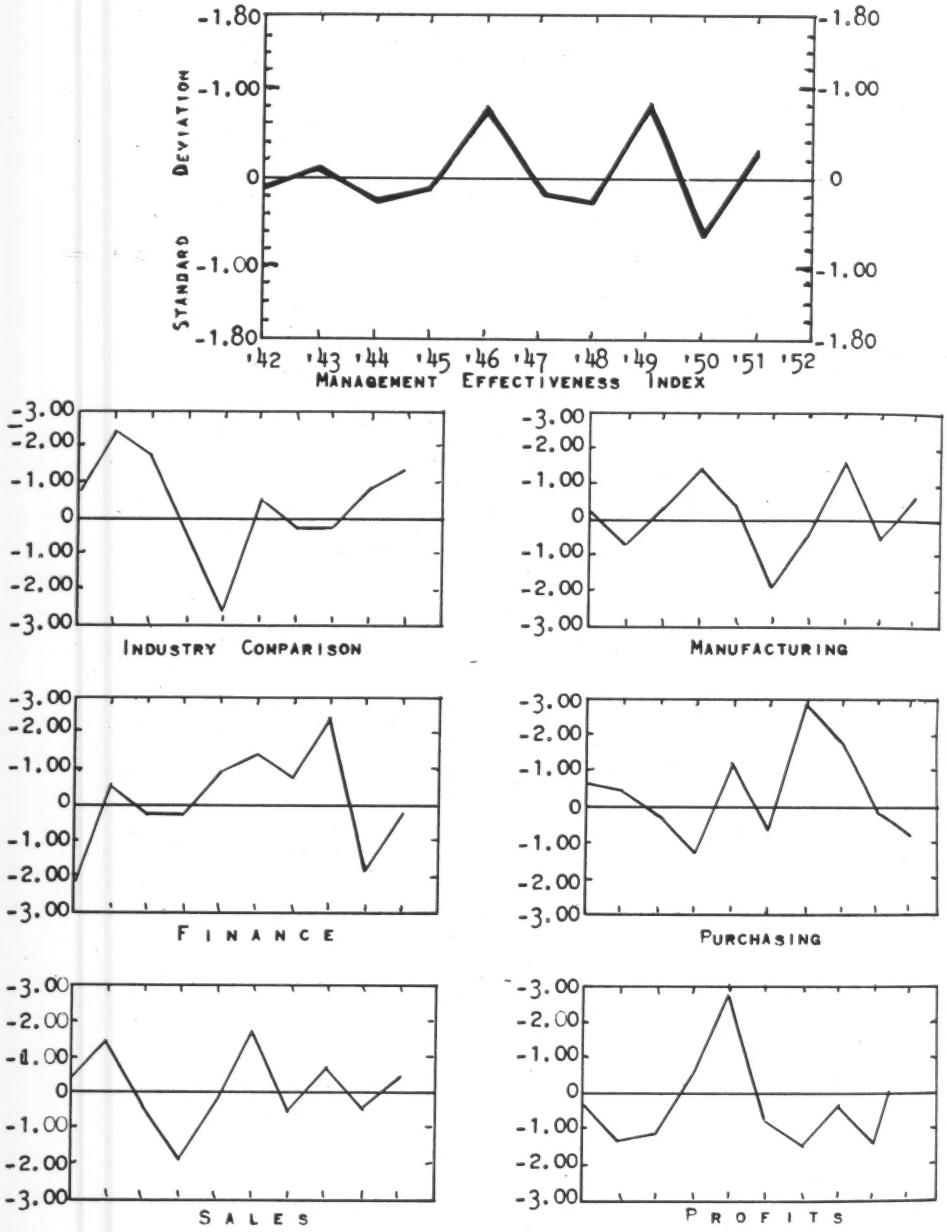
Address.....

City.....**State**.....

Number of Foremen and/or Supervisors in your organization.....

Figure 2

MASTER CONTROL CHARTS



Then the computation for any one period might be:

	S.D. Index	Weight	Extension
Industry	+1.30	1	+1.30
Finance	— .25	1	— .25
Sales	+ .40	2	+ .80
Manufacturing	+ .60	2	+1.20
Purchasing	— .75	1	— .75
Profit	+ .20	3	+ .60
			+2.90
			+ .48

This is the figure which would be posted to the Management Effectiveness Index chart. Table 1 illustrates computation of weighted figures to compute the composite index. Figure 2 shows the general appearance of the management effectiveness index and its six subsidiary index charts plotted from the data of Table 1. Again, for purposes of visual simplicity, annual and not monthly figures are used. By means of these seven charts, the president can schedule his fishing trips!

TABLE 1
Illustrative Data for Plotting the Charts in Figure 2

	1942			1943			1944			1945			1946		
	S.D. Index	Weight	Extension	S.D. Index	Weight	Extension	S.D. Index	Weight	Extension	S.D. Index	Weight	Extension	S.D. Index	Weight	Extension
Ind.	+ .75	1	.75	+2.40	1	2.40	+1.80	1	1.80	— .40	1	— .40	—2.70	1	—2.70
Fin.	—2.70	1	—2.70	+ .50	1	.50	— .25	1	— .25	— .25	1	— .25	+ .85	1	.85
Sales	+ .30	2	.60	+1.45	2	2.90	— .35	2	— .70	—1.90	2	—3.80	— .30	2	— .60
Mfg.	+ .20	2	.40	— .75	2	—1.50	+ .30	2	.60	+1.45	2	2.90	+ .35	2	+ .70
Purch.	+ .60	1	.60	+ .40	1	.40	— .25	1	— .25	—1.30	1	—1.30	+1.15	1	+1.15
Profit	— .25	3	— .75	—1.30	3	—3.90	—1.15	3	—3.45	+ .60	3	1.80	+2.80	3	+8.40
Algebraic Sum			—1.10			+ .80			—2.25			—1.05			+7.80
Weighted Average			— .11			+ .08			— .23			— .11			+ .78

TABLE 1
Illustrative Data for Plotting the Charts in Figure 2 (continued)

	1947			1948			1949			1950			1951		
	S.D. Index	Weight	Extension	S.D. Index	Weight	Extension	S.D. Index	Weight	Extension	S.D. Index	Weight	Extension	S.D. Index	Weight	Extension
Ind.	+ .50	1	.50	— .25	1	— .25	— .25	1	— .25	+ .85	1	.85	+1.30	1	1.30
Fin.	+1.30	1	1.30	+ .75	1	.75	+2.40	1	2.40	—1.80	1	—1.80	— .25	1	— .25
Sales	+1.70	2	3.40	— .50	2	—1.00	+ .70	2	1.40	— .40	2	— .80	+ .40	2	.80
Mfg.	—1.90	2	—3.80	— .30	2	— .60	+1.70	2	3.40	— .50	2	—1.00	+ .60	2	1.20
Purch.	— .60	1	— .60	+2.80	1	2.80	+1.80	1	1.80	— .15	1	— .15	— .75	1	— .75
Profit	— .80	3	—2.40	—1.45	3	—4.35	— .25	3	— .75	—1.30	3	—3.90	+ .20	3	.60
Algebraic Sum			—1.60			—2.65			+8.00			—6.80			+2.90
Weighted Average			.16			— .27			+ .80			— .68			+ .29

YOUR KEYS TO BETTER MANAGEMENT— ANNUAL SAM CONFERENCE

HOTEL STATLER, NEW YORK CITY

OCTOBER 30-31, 1952

This stirring theme takes you behind the scenes into the sessions of the Annual SAM Conference. A program composed of the essentials for management today, will be presented by top executives with national reputations in their respective fields.

The past history of record breaking conferences was taken into consideration by Eldridge Haynes, Annual Conference Chairman and his members: William Witte, Harry A. Cozzens, Jr., J. Rhett Ball, and J. Orvis Keller when they began to lay the foundations of this conference on "Executive Development". You will hear how to get work done through others, how to appraise executive talent, how to teach the total management job, how to handle difficult personalities, and how to make wiser management decisions.

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A New Emphasis in Cost Reduction

By ALLISON V. MacCULLOUGH
Consultant, Organization Planning and Management Development

More effective personnel administration offers major opportunities for cost reduction and increased productivity.

EVERY THOUGHTFUL consideration of the future indicates that a twenty-five to thirty-five percent increase in productivity must occur in the next ten years if a manufacturer hopes to stay in business and meet competition.

The introduction of labor saving machines has become common-place and we are all familiar with the advances in design and efficiency in machines for office and plant. Recognized inadequacies in layouts have led to major and expensive re-arrangements. We have done a superlative job of market research. We have developed our advertising and sales techniques to a new high in effectiveness and finally, hundreds of millions of dollars have been poured into technical research in a host of areas including chemistry, physics, textiles and plastics.

AN EXECUTIVE "BLIND-SPOT"

Considering all industry in America, these functions in which such notable improvements and advances have been made account for about sixty percent of the total cost of doing business. But what about the other forty percent? What does it consist of? Can similar improvements be made there? If so, why shouldn't there be? And how can we achieve them? The answers to these questions seem to reveal a curious case of executive myopia or it may be only an executive "blind-spot" that blots out or denies proper evaluation of an entire area of greatest importance—the personnel area. It will not be disputed that approximately forty percent of our total costs goes into payroll—into the human aspects of organization — an area that has been relatively unexplored for cost reduction possibilities; for the answer to increased productivity.

Professor Elton Mayo is quoted as saying that "while material efficiency has been increased for the past eight hundred years, the human capacity for working together has in the same period of time continually diminished. Of late the pace of this deterioration seems to have been accelerated." This problem has been identified as a matter of human motivation—the human will to work. Certainly we know that if our pioneering ancestors in this country indulged in featherbedding practices our frontiers—both geographic and economic— never would have been advanced and our present stage of development would still be in the future.

The same genius — the American "magic touch" — that has characterized cost reduction efforts in industry in so many other areas has not yet probed inquisitively into the human area to anywhere near the same penetrating depths that it has investigated the other factors contributing to costs. Why this is true is not clear. Some say that Americans are more interested in things than in human beings; that we are as wasteful of our human resources as we are of our other national resources; others might say that the relationship of Capitalism to human freedom has never been adequately explored or widely understood.

It is encouraging that recently there has been an increasing awareness of the importance of human relations to the effective functioning of business as a whole.

The president of one of our highly successful medium sized corporations has established the policy of decentralization of his production facilities to achieve increased productivity since it is his firm belief that small plants—and that is all that he now has—located in small cities or towns somehow or other are more conducive of higher productivity per employee than similarly well equipped and planned; but larger, plants located in urban areas. C. Wright Mills makes the helpful observation that "in one hundred years the United States has changed from a country of small capitalists— their own men —to a country of employees who are forever somebody else's men——." We do know that in the early part of the nineteenth century probably four-fifths of the working population was self-employed and that by 1940 the proportion of the self-employed was down to about one-fifth of the total working force.

HUMAN MOTIVATION THE ANSWER TO PRODUCTIVITY

Regardless of what may be the cause, superficial or not, American management must explore all the human factors which contribute to productivity and do it with the same objectiveness and thoroughness that characterizes its research in other and smaller areas. The application of such findings will be just as fruitful of savings in production costs as similar work in the several areas which total the first sixty percent and where we have done such a remarkable job and where we may be reaching a point of diminishing returns. Even a brief glimpse of the economies that are possible in the "personnel area" are startling in their scope

and magnitude. For example, thoughtful consideration given the matter of worker productivity results in estimates that workers are producing only sixty to eighty percent of what they are easily capable when they are properly motivated to do a day's work.

MAGNITUDE OF OPPORTUNITIES

Let's take the case of a small company which produces and sells $10,000,000 worth of its products annually. So that we won't be dealing in Utopian dreams let's not assume that the work force will increase its productivity twenty to forty percent. Let's be far more realistic and assume a productivity increase of only five percent. What does that mean in terms of sales? Nothing less than a half million dollars! A one percent improvement in production would amount to $100,000—a not insignificant sum for a small company even in these days. In considering this problem, as it affects his company, the Vice President of one of this country's largest railroads has determined that a one percent improvement in labor efficiency would equal twelve cents per share after taxes! A fair question for stockholders as well as management and workers is "What would it amount to in the case of your company?" A one percent increase in employee efficiency in some cases would mean the difference between success and failure, expansion of plant and extension of research or none. Certainly, a one percent improvement in executive performance would be even more significant in a year's operation.

ROLE OF DIRECTOR OF PERSONNEL ADMINISTRATION

Since the area under discussion is the personnel area, and even though Personnel Administration is a responsibility of every person in the chain of command it becomes possible and perhaps logical to think of the Director of Personnel Administration as the cost-reduction specialist of the future. To do so is but to copy established industrial practice when frequently an engineer, or an industrial engineer or the controller is given the meaningful title of "Cost Reduction Specialist" when working in the first mentioned and more traditional areas which have already proved so productive of savings. Obviously, this is not to say that the professional specialist in Personnel Administration can operate in any manner other than in staff capacity. While he can spear-head critical and constructive thinking along these lines and organize and administer a staff department which will act in accord with these concepts, he must know that the rest of top-management also fully appreciates the profit-making nature, or perhaps we should say the cost-reduction nature, of the personnel function. In fact it might correctly be claimed that perhaps his biggest job, and certainly a continuing one, is to eternally keep the significant and exciting possibilities of cost reduction in the payroll area before the rest of the organization. The potentialities inherent in this concept are of interest to everyone in the enterprise, since all can participate and contribute substantially toward its fulfillment. In fact, if anything less than 100 percent involvement is secured the full potentialities will not be realized. The factor of personal involvement makes this concept of cost reduction stand out in sharp contrast to cost-reduction techniques in other areas where only a few specialists are "in the know" and contribute to the achievement of the goal.

It is needless to point out the calibre and characteristics of the "cost reduction specialist" of the future except to say that he will be a well balanced individual of wide experience who in addition to being familiar with the technical side of personnel administration is also a good administrator. It may likewise be assumed that in addition to having personal stature he has organizational stature in that he is a vice president of his company and participates along with the other vice presidents in policy formulation concerning all functions of the company and is generally involved in the overall planning of the enterprise. In fact, in addition to being one of the best informed officers concerning company affairs he must be creative and imaginative in vision and statesmanlike in concept and perspective.

PRODUCTIVITY A "LINE RESPONSIBILITY"

But for those who still think of the Personnel Director as one who runs the employment office, handles labor relations or who dabbles in welfare or recreational activities frequently on the periphery of operating realities let us not debate at this point the personal role of the specialist in Personnel Administration. Since cost reduction is clearly identified as a "line" responsibility anyway, let's explore—even though but briefly—the basic theme, namely, the *Cost Reduction Nature of the Personnel Function* and how it may be implemented.

WHAT CAN BE DONE?

Anyone paying attention to this problem will be quick to see cost reduction possibilities in an improved organization structure. By always working consultatively first in determining the fundamental nature of the business—and this isn't always apparent—explorations will lead into an examination of the basic divisions of the business, their functions, their appropriateness and their interrelationships. It is recognized that bad human relations or politics anywhere in the enterprise is frequently indicative of poor organization. It is usually true that such deplorable conditions exist more because of organization deficiencies than because of the pure cussedness of human nature. Inadequate organization structures are far more costly in terms of smooth and efficient operation than an eight cylinder motor that is hitting on only five or six cylinders.

Surely there can be no argument as to the high cost to any company of poor organization whether it is found in the upper brackets of the structure where the top executives and their subordinates are ineffective because their responsibilities are not clearly defined, in the plant with a bad foreman-worker situation, in the Research Department or in the front office. The appropriate solution of organization problems developed by "line and staff", constitutes a "gold mine" of opportunity for real cost reduction and increased productivity.

It has been repeatedly shown that it is essential for a company to have clearly written and well defined Personnel Policies. Such policies, if good, give substance, relativity and significance to otherwise isolated acts of management and supervisors affecting employees. Policies serve as an invaluable guidepost and expeditor to all who make decisions and who direct the labor of others. In the maelstrom of daily contacts they serve as a beacon pointing the safe way through the tortuous channels of human relations to the profitable operation of a business. The cost of poor policies or

lack of policies is inestimable and constitutes another major opportunity for cost reduction in the personnel area.

MANAGEMENT DEVELOPMENT

Still another fruitful area for cost reduction may usually be found in our common failure to provide for management continuity. Our neglect has at least two facets; first, there is what frequently appears to be a naive assumption that there are no executive functions — as distinct from technical responsibilities — and therefore there is no need for executive training; and secondly, there is no need to give as serious thought to the replacement of executives as is ordinarily given the replacement of things— we rarely have an inventory of executives. There could be no costlier mistake. Most managements are continually alert to the need for controlling inventories and other assets, protecting their capital position, developing improved products and services and in expanding their markets. Yet the condition of the most valuable resource of any business — its executive personnel — is too frequently left to chance with no program for executive development and replacement devised and pursued actively to allow for the future needs of the business.

EXECUTIVE HEALTH

An important part of the problem of management continuity is the matter of executive health. While it has not been proved that there are more factors or stronger factors contributing to the breakdown of executive health and effectiveness than there are other occupational groups, there can be no dispute about the costliness to a company of the death or disability of one of its key executives. It is readily appreciated that a well trained and experienced officer represents a considerable investment which needs protection as do the other assets of a business. A thorough diagnostic examination program for executives — both senior and junior — is indicated as a means of detecting physical ailments while they can be cured or controlled. Examination "of the whole man" is of equal importance as a means of recognizing those factors affecting an executive job which take a heavy toll of executive efficiency such as frustrations, pressures, responsibilities and organizational and policy deficiencies. Stockholders and employees have a vital and mutual interest in the calibre and health of the executives managing their companies.

COMMUNICATIONS

During the last few years considerable attention has been placed on "communications" in an effort to give employees some of the facts about "the company" and the economic system in general. Actually this effort has become a major preoccupation. We have been consumed with a burning passion to tell those who work for us what our problems are and secondly, how they ought to feel about them. Our thinking has been saturated with the idea that we must explain our practices and our motives — as if they were not obvious. Perhaps we ought to reflect on the dictionary definition of the word "communications." We will find that "communications is an interchange of thought."

Perhaps it is otherwise stated in the old admonition that "one never learns anything while he is talking." Before employees will accept management facts, as we love to call them, they first must have overall confidence in the motives and sincerity of management. It cannot be expected that a worker will be highly productive when he is part of a system that he fails to understand but also toward which he feels no sense of involvement or devotion. It seems to be forgotten that our American political and social life creates a feeling of independence and the right to be heard. Yet this characteristic bred into Americans is given but little or infrequent opportunity for expression in the work life of employees since our "communications" usually are a one way device — downward. If the attitude of the worker, if his loyalty to his company and his understanding of our economic system have any bearing on his efficiency then our endeavors to lower costs will surely include every effort to develop the understanding of the worker on such matters and management's understanding of the worker.

Two years ago Peter Drucker expressed a thought regarding the inadequacies and dangers of our industrial communications concepts and systems as follows, "To me the absence of any understanding on the part of employees as to what the business situation is and what management functions are is matched by a similar lack of understanding on the part of management about what the worker sees, needs, what the union is and how it functions. This absence of understanding on the part of workers about economics and about the management function in the industrial enterprise is, I think, our major political danger. If this country goes collectivist within the next ten to twenty years — it will be because the great and overwhelming majority of the population resist and deeply resent the management function and profits." It may be agreed that good communications is not only a matter of cost reduction, it is also a matter of survival.

CONSTRUCTIVE APPROACH TO LABOR RELATIONS

Let's look at another function of Personnel Administration — Labor Relations. Can less costly contracts be written? Can strikes, "slowdowns" and "group illnesses" be eliminated or reduced? Must we "give away our shirts"

in order to keep industrial peace? There is much evidence that management in its dealings with unions is "playing by ear" — from day to day — with expediency as its motto. There frequently appears to be a lack of basic policy on labor matters which would serve as a foundation for and give consistent direction to labor relations. A well established company usually has a policy which guides its sales efforts, a policy in respect to technical research, and its public relations and other functions of the business are based on an understood policy. Isn't it just as necessary — and profitable too — to have a well defined policy in labor matters? Without the benefit of policy, management will remain on the defensive in labor relations rather than on the offensive which is the more economical approach as well as being more constructive.

NEED FOR PERSONNEL RESEARCH

It may be said that perhaps this country's greatest resource is its untapped manpower. Human energies—and goodwill have been largely overlooked while designers and scientists have sought mechanical, chemical and electronic means of replacing the individual. Surely no one can seriously question the value of these technical advances and their contribution to human welfare but a major doubt can be expressed as to whether American industry has achieved balance in its research efforts when the human area has been so generally ignored. While we have spent hundreds of millions of dollars improving our technical processes we have largely overlooked the individual and the satisfactions he seeks from the job and what tends to speed him up or slow him down.

It is a source of amazement that American management which demands facts in respect to all other phases of its operations is so complacent in the absence of facts concerning human beings and their will to work. If we are to secure the benefits of cost reduction in the personnel area then we must support extensive research in that field as generously as we finance it in technical areas, endow professorial "chairs" and provide scholarships in engineering and scientific schools.

As an example of the possibilities of savings in the personnel area it is reported that the Society for the Advancement of Management in 1947 found that in the opinions of its members a twenty percent improvement in labor productivity could be obtained if we always had the right man on the right job.

What we don't know about incentives would fill a library, yet we do have knowledge of the splendid results obtained from financial incentives in many a company, among them being the Lincoln Electric Company of Cleveland which has used them for many years and which has used them with spectacular results. We know too, that the human relations approach to Work Simplification as advocated by Allan Mogensen pays off in terms of satisfaction to the worker, improved loyalty to the company and increased productivity which benefits all parties.

Yet, as a rule, we fail to make general use of these experiences which have proved so effective in increasing productivity and reducing per unit costs. With all due respect to the genius and devotion of our scientists, engineers and designers who will continue to operate effectively in other areas, there is serious doubt if American industry can achieve its goal of increasing its productivity by 25% or more during the next ten years unless it applies the findings already extant in the personnel area and considerably enlarges on this body of knowledge.

CONCLUSION

In the final analysis, the most urgent problems of business success and survival are human problems, human motivations, human productivity and human cooperation. They are tough ones but they must be solved if we are to overcome the emotional impoverishment of the worker in respect to his job. Our economic system can only be kept alive if it is aligned with the hopes and aspirations of the people it serves.

The answer, in part at least, is a clearer recognition by management of the cost reduction nature of the personal function.

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The Management Bookshelf

The Development of Executive Talent, by JOSEPH DOOHER and VIVIENNE MARQUIS, AMA.

This memorable piece of literature is rightfully named "a handbook of management development techniques and case studies" particularly so because the interest in training and developing executives is presently at an all time high.

Management's job is becoming increasingly complex, due to government intervention, labor-management problems, progress made in scientific management, and due to keener competition in all phases of managing an enterprise.

This book is mainly assembled from the best papers presented before AMA conferences, and skillfully supplemented by specially prepared chapters by men who are doing or have done yeomen's work in Executive Development for some of America's most successful concerns.

Such phrases as "an executive is any supervisor in any organization who possesses the courage to dream, the ability to organize, and the strength to execute" clearly indicates that no unnecessary words are used to illustrate in a practical, useful, down to earth manner, the job confronting all of us.

Let's take part of another paragraph explaining the present executive shortages: "Our era of specialization fails to equip men of executive caliber with the broad background needed for top management jobs. Most of Today's younger executives have remained specialists, working primarily in a limited field. Few have had the over-all experience which qualifies them for promotion to the top management group."

How true, and what a perfect analysis of today's predominant problem.

This particular author further states: "Many large companies have found that men who work up by the conventional promotion system all too often do not reach the top levels until they are past the age of maximum effectiveness."

How are these problems going to be solved? By an effective executive development program which will:

1. Better utilize executive abilities.
2. Assist executives to function more effectively in their present jobs.
3. Develop managers who can think broadly from an overall company viewpoint.
4. Increase teamwork in the management groups.
5. Help you build a reserve of qualified executives.

From cover to cover the book is jammed with case studies, training guides, outlines of programs, rating forms, progress review forms, and development guides, which can effectively be used to formulate an effective executive development program for any company.

It would take years for anyone to assemble such a wealth of information of this subject. The AMA is well deserving of the highest compliments for this masterpiece in management literature.

Top management would do well to place this book not in the library but in the hands of every executive, as it is as interesting to read as it is valuable to the growth and future of every executive in every progressive company.

DON F. COPELL
Vice President
Wagner Baking Corp.,
Newark, N. J.

Cost Accounting, by ADOLPH MATZ, O. J. CURRY, GEORGE W. FRANK, Southwestern Publishing Company.

The thirty chapters and about eight hundred pages of text contain, certainly, more than the above title reveals. In addition to the traditional approach of textbooks on cost accounting, consisting namely of a description of the job lot, process and standard cost systems, the authors have devoted considerable space to other important and closely related topics.

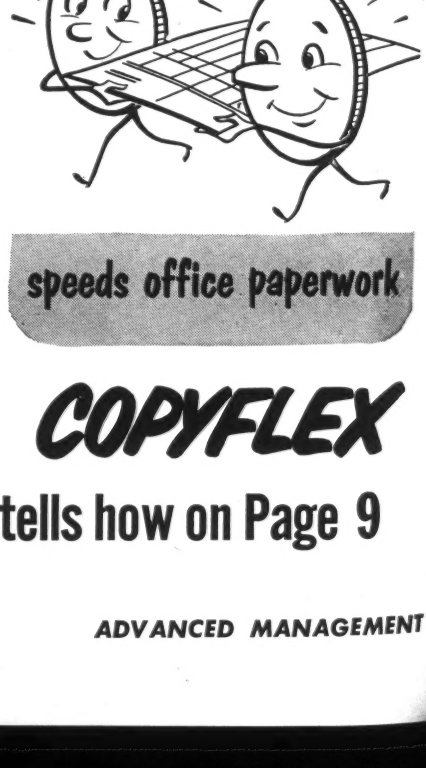
Three chapters deal with budgeting: one chapter with distribution cost, one chapter with break-even analysis and one with differential cost. All of them constitute good reading and excellent teaching material. The discussions about the flexible budget are considered by this reviewer as some of the best and most lucid pages in accounting literature on this subject.

When a book is written by several authors, occasional instances of inconsistencies of viewpoint are almost unavoidable. Matz, Curry, and Frank have managed, however, to co-ordinate their efforts so that none become apparent.

Each chapter of the book is supplemented with discussion questions, exercises and problems. A job lot and a standard practice set are incorporated into the text.

Teachers and students alike will welcome this excellent book. No doubt many students will keep it as a handbook and reference text, which will be handy and valuable in their future careers in industry.

DR. MICHAEL ALBERY
Associate Professor of Finance
and Industrial Management
Boston College



Motor Freight Workshop, by BERNARD FREDERICK CONROY, Exposition Press, Inc., New York, 244 pages, Indexed. $10.

This is a book which covers all phases of terminal operations of a motor carrier. It is a practical book by a practical man who, unquestionably, knows the motor freight business. It is factual and, at the same time, Mr. Conroy draws freely on his own experiences of over twenty years in the industry to illustrate his points in a most effective manner.

It is a readable book. Aspects of any business which so frequently are considered dry and necessary evils to be ignored, are presented in a fascinating manner. How could anyone become enthused over billing freight eight hours a day? The author's style is smooth, yet to the point. Humorous experiences and anecdotes appear throughout. For instance, in remarking about the responsibilities of the cashier in a terminal, he comments: "Money, like liquor, is everyone's property if it is not properly watched. One cannot use too many safeguards for its protection."

Mr. Conroy does not hold any punches in his criticism of top management. He is brutally frank in pointing out managerial errors and lackadaisical thinking. He is the champion of the underdog, and continually upholds the lot of the humble employee. Throughout the book, sensible, workable, progressive employer-employee relations are intermingled with his analyses of efficient terminal operations.

Mr. Conroy is most generous in his ideas, backed by his own experiences, of how bad situations may be improved. To him, obviously, warehousing methods are in need of careful study and a thorough overhauling. "As their superiors see it, the warehousemen seldom handle enough freight, seldom handle it right, seldom check it right. But never are they told what is a day's respectable quota." His analogy to the handling of a bale of cotton is priceless. His insistence for a clear cut functional organization within a terminal is well taken. "The most important item in its operation to assure success is organization." Responsibility must be matched with corresponding authority.

The profit motive is the greatest incentive for management; but to realize profits, there must be constant supervision of costs. Of course, that is no new theory; but the manner in which the author constantly keeps costs before the reader, with numerous suggestions by which costs can be reduced, is worthy of the most serious consideration by every motor freight operator. Although this reviewer does not agree with *all* his proposals, particularly regarding employment of extensive supervisory personnel, yet many of his points are well taken.

The book contains an excellent description of the functions of the several departments within a terminal and the responsibilities of the terminal manager —rating, billing, cashier, OS&D (over-short-damage freight), warehousing, local dispatching, interline traffic, labor contracts, safety, sales, customer relations, etc. Intermingled throughout these discussions are found the "homey" illustrations of the author's experiences, and the constant plea for greater efficiency in management and a better understanding of human relations. Management of a motor freight company constantly is dealing with people; and, although Mr. Conroy does not state in so many blunt words, there can be no question of his thought that people can either make or break the best operation. Those people are the carrier's employees, the employees of its interline connections, and the employees of its customers. He urges that mistakes of the past be forgotten, other than that they should serve as a lesson; and that management plan for a constructive future.

The aim is greater efficiency in terminal operations. The author explains in no uncertain terms how that objective can be accomplished, from avoiding solicitation of undesirable "balloon" freight, the activities of the pickup driver, the handling and checking of traffic across the dock, stowage, unloading at the destination terminal, to final delivery to the consignee and collection of lawful freight charges.

For the layman, this volume contains more practical information between its two covers concerning terminal operations than any other one book with which this reviewer is familiar. For the terminal employee, it spells out recognition for devotion to duty. For the professional trucker, the book should give him many valuable hints whereby his net profits may be increased. For the student of motor carrier transportation, the book is a "must" in that it gives a clear picture of the operations of a motor freight terminal and the problems confronting the terminal manager. For the terminal manager, it should be his Bible.

WILLIAM WAY, JR.
Professor of Transportation
and Chairman, Transportation
and Public Utilities Dept.
University of Tennessee

(Ed.—The motor carrier educational program at University of Tennessee has received wide national recognition and it is believed to be the most comprehensive in the country. It was for this reason, together with the fact that Prof. Way is widely known and respected by the industry, that we called on him for an unbiased review. Prof. Way has informed us he will adopt the book as a text in one of his courses.)

The National Research Committee of S.A.M. will meet Friday, October 31, 1952, at 5 P.M., at the Hotel Statler, New York City, New York, for the purposes of outlining the Research Projects. The following members of this Committee should be present at this meeting.

J. O. P. Hummel
Assistant Vice President and Chairman

Harvey E. Becknell
F. F. Bradshaw
Bishop Brown
William H. Brush, Jr.
Don Copell
Phil Carroll
Ralph C. Davis
James H. Eddy
Frank E. Fehlman
Howard K. Hyde
David B. Porter
Alex W. Rathe
K. O. William Sandberg

AMC INTERNATIONAL NEWS

American Industrialists and Engineers Hold Seminars in New York for 200 Eminent Europeans

IN COOPERATION with the Mutual Security Agency and with the assistance of the Engineers Joint Council, the National Management Council has arranged a four-day series of seminars from August 27th through August 30th for the 200 European members of the Engineering Study Mission, with distinguished American industrialists, engineers and educators heading the discussions. The Europeans are in New York en route to Chicago to attend the Sept. 3-13 Convocation of Engineers celebrating the Centennial of the American Society of Civil Engineers.

Announcement of plans for the visitors, most of them from Marshall plan countries, reveals some 25 tours to more than 80 United States cities, where the foreign industrialists, engineers, contractors and educators, will inspect and study American engineering enterprises and programs in their fields. Visits to some 220 plants have been arranged through the very generous cooperation of United States industrialists.

These study tours, organized and arranged for MSA by the National Management Council, will occupy two weeks following the Convocation. Thereafter, the visitors will have a two-day program in Washington. On the way home they will return to New York for a tour of its outstanding engineering works. In addition to approximately 200 from Europe, an additional number, approaching 200, will join with them in the Chicago events. These men will come from South America, Australia, Thailand, Formosa, India and other areas.

It is estimated that altogether 30,000 persons, representing 61 American and foreign engineering societies in all branches of engineering, will attend the technical sessions of the Centennial of Engineering. More than 1,000 papers will be presented. There also will be twelve symposia on subjects vital in everybody's daily life, which will be conducted by eminent Americans and will be on a tone enabling the layman to understand the discussions.

The Convocation's springboard is the Centennial Year of the American Society of Civil Engineers, founded in New York, and the civil engineers have scheduled the most comprehensive convention program in the Society's history. However, the Century of Engineering Progress is a celebration of the entire engineering profession in all its branches. Directors of the non-profit corporation created to conduct the event include Herbert Hoover, Charles F. Kettering, Benjamin F. Fairless, Chancellor Henry T. Heald of New York University, David Sarnoff and many other distinguished Americans. The Convocation will be the greatest gathering of engineers in history.

Sponsors of the program arranged for the New York City visit of the European group include a number of engineering societies with the following presidents assisting the National Management Council in its plans: Carlton S. Proctor, American Society of Civil Engineers; Michael L. Haider, American Institute of Mining and Metallurgical Engineers; R. J. S. Pigott, American Society of Mechanical Engineers; D. A. Quarles, American Institute of Electrical Engineers, and William I. Burt, American Institute of Chemical Engineers.

Thomas H. Chilton, Technical Director, Engineering Development Division, E. I. du Pont de Nemours Company, and Vice President of the Engineers Joint Council will preside at the New York seminar sessions. Speakers will include Colonel Willard Chevalier, Executive Vice President, McGraw-Hill Publishing Company, L. E. Briggs, Treasurer, Ford Motor Company, Marquis Childs, Political Commentator, The Washington Post, Dean Thorndike Saville, College of Engineering, New York University, Professor Herman Krooss, Graduate School of Business Administration, New York University, Professor Peter F. Drucker, Graduate School of Business Administration, N. Y. U., and other distinguished authorities.

Outlining the general plan of the program, the National Management Council said:

"The purpose of the Engineering Study Mission is to quicken the interchange of knowledge between American and European engineers and to provide a basis for mutual acquaintance of the attitudes underlying managerial principles and practices on both sides of the Atlantic.

"The mission will take the form of a general inquiry into the role of the engineer in the United States and the influence of his activities on living conditions and the progress of civilization. Any exchange and inquiry of this type will ultimately be helpful in stimulating higher industrial output — the higher productivity needed to strengthen our mutual defenses against aggression and, at the same time, raise living standards generally.

"The visits to industrial plants, technical institutes and outstanding engineering works after the Chicago Convocation are intended to demonstrate how the American engineer, by his professional skill and executive capacity, makes a practical contribution toward raising the standard of living and utilizing the natural resources of his country in the most rational and economic way."

How To Apply Statistical Cost Control To Labor Costs

By JOHN EVANKO, Jr.
Time-Study Engineer, Cost Estimator
Weston Electric Instrument Corporation

Statistical Tools are Proving Increasingly Useful in Managerial Control

LABOR COSTS serve to determine the efficiency or inefficiency of manufacturing. The haphazard producer seldom knows the facts that cause unpredictable costs. Here is a basic Labor Cost Control Program which may serve to bring efficiency and profit to the manufacturer.

All manufacturers are primarily concerned with the cost of direct labor in their endeavor to produce products for a substantial margin of profit. Further, the manufacturer therefore must have some knowledge of deviating costs or cost variations. The said cost variation is that cost above the anticipated standard cost caused by specific inefficiences in the means of production.

In an attempt to aid the manufacturer, all the factors attributed to the direct labor cost have been charted so that the weight of each said factor may be financially evaluated. The manufacturer may see at a single glance what conditions are causing the greatest variation or dollar losses. Proper statistical evaluation further serves to aid the manufacturer in his endeavor to determine the need and place for immediate corrective action.

CHARTING THE LABOR COST

Any attempt to develop controls for anticipated costs must follow a systematic procedure for tabulating all segments of the said cost. It has been determined therefore, by numerous Industrial Experts, as for example, Ernst and Ernst, and Raymond, that all Direct Labor Cost factors must be made known so that Management may deal intelligently with this important problem. We may readily observe that the entire Labor Cost picture should be tabulated for each unit, as for example a department, in a given manufacturing organization. The complete Labor Analysis Report as presented in Figure 1 includes maximum Labor Management Relations conclusively covered in the Incentive System. However, the less fortunate manufacturer may still utilize the Labor Cost Control presented, taking care, however, to merely exclude the conditions that are not applicable to his unique Labor Cost conditions.

The following is the breakdown for the Labor Analysis Report from which all statistical control activity may initiate. Management has a single composite labor cost picture from which to direct remedial activity.

The reader will find that the Total Direct Labor Cost is tabulated for a given unit or department for a specific week. Further, he will find that all factors entering into the total labor cost picture are presented in detail. The concluding figures to be recorded under the WORK-PAY headings serve to show the manufacturer the cost of the work received as against the amount of money paid for the said work. Statistical values may be plotted for the numerous conditions for whatever relative values management desires. For example, a sufficient number of readings for any given condition will serve to establish a normal range or trend from which corrective activity may follow. (See Figures 2-11). Specific definitions for the Labor Analysis Report Categories follow:

WEEK ENDING
This represents the date on which a payroll week is completed.

TOTAL DIRECT LABOR DOLLARS
This is the total Direct Labor Dollar cost for a given unit or department.

DAYWORK DOLLARS
Day work or hourly rate dollars including adjustments for overtime applied to the day work.

MEASURED DOLLARS
This figure includes all base dollars plus premium dollars.

BASE DOLLARS
The total dollars paid as base or guaranteed wages at given wage rate classifications.

PREMIUM PLUS PREMIUM ADJUSTMENT
The premium plus premium adjustment (or Bonus plus Bonus adjustment).

TOTAL DOLLARS (MEASURE)
The base dollars plus extra pay dollars.

PERCENTAGE COVERAGE
Total measured dollars divided by the total dollars.

STANDARD DOLLARS
This is equivalent to earned hour dollars.

COST PER STANDARD DOLLAR
The actual cost divided by the standard cost

A.C.
S.C.
C./STD.$

TOTAL VARIANCE DOLLARS
The total direct labor dollars minus the standard dollars.

LABOR ANALYSIS REPORT

FOR

DEPARTMENT NO. ___ DATE ___

WEEK ENDING	TOTAL DIRECT LABOR $'S	DAY WORK	MEASURED			% COVERAGE	VARIANCE			LOSS ANALYSIS													INDEXES	
			BASE $'S	XTR. PAY P+PA%	TOTAL $'S		STD. $'S	COST PER STD. $'S	TOTAL $'S VARIANCE	DELAY TOT $'S VAR.	WAITING TIME $'S	OVER TIME $'S	UNMEAS WORK RS. ORDER	UNMEAS WORK * RESERV.	EXTRA OPER.	REWORK	METHODS CHANGE	MACHINE CHANGE	MAC-TOL. TROUBLE	OFF STD. MATERIAL	PROD. DEVEL.	MISC.	EMPLOYEES WORK	EMPLOYEES PAY
9-30-51	$ 22,770	$578	$11939	$ 2,763	$14,702	65%	$15,280	$155	$4,527	$3,364	$ 281	$2,963	$1,604	$660	$295	$423	$248	$200	$203	$215	$200	$200	$ 15,280	$22,770
10-7-51	$23,375	$520	$12,565	$ 3,184	$15,749	69%	$16,069	$1.50	$7,199	$2,088	$ 201	$3,107	$1,353	$647	$314	$359	$276	$ 200	$206	$233	$197	$213	$16,069	$23,375
10-14-51	$24,121	$820	$14,017	$ 2,933	$15,750	65%	$16,576	$1.53	$4,304	$2,261	$ 270	$3,247	$1,509	$583	$ 261	$ 432	$ 302	$200	$ 213	$ 220	$204	$190	$16,570	$24,121
10-21-51	$25,542	$1,218	$13,317	$ 3,352	$16,169	65%	$17,687	$1.55	$4,404	$2,024	$ 336	$3,451	$1,374	$708	$220	$ 337	$247	$201	$205	$260	$ 276	$240	$17,687	$25,514
10-28-51	$25,380	$957	$13,319	$ 3,239	$16,359	64%	$17,315	$1.55	$4,553	$2,329	$ 301	$3,512	$1,039	$525	$340	$ 325	$ 288	$203	$217	$243	$207	$215	$17,315	$25,380
11-4-51	$25,348	$1,134	$13,181	$ 3,581	$16,562	65%	$17,696	$1.53	$4,161	$1,931	$ 255	$3,491	$1,084	$619	$ 240	$287	$ 273	$205	$224	$ 454	$ 267	$253	$17,696	$25,348
11-11-51	$23,571	$ 972	$12,729	$ 3,100	$15,629	66%	$16,661	$1.51	$4,014	$1,999	$ 255	$2,956	$1,098	$516	$ 481	$ 308	$207	$ 281	$ 241	$ 200	$ 216	$211	$16,601	$23,571
11-18-51	$24,525	$1,038	$13,114	$ 3,399	$16,313	67%	$17,351	$1.50	$3,636	$2,013	$ 111	$3,548	$1,151	$600	$240	$ 449	$320	$ 278	$220	$267	-0-	-0-	$ 17,351	$ 24,525
11-25-51	$21,124	$ 754	$10,178	$ 2,594	$13,572	64%	$14,326	$1.56	$3,288	$1,586	$ 252	$3,509	$ 768	$526	$ 238	$ 460	$ 242	$213	$ 221	$ 298	-0-	-0-	$14,326	$21,124
12-2-51	$18,638	$ 800	$13,200	$ 3,517	$16,710	92%	$17,510	$1.11	$1,128	-	$ 95	-0-	$ 520	$ 130	$ 90	$ 95	$ 9	-0-	$ 185	$ 24	-0-	-0-	$17,510	$18,638
12-9-51	$17,891	$ 972	$12,991	$ 3,017	$15,988	89%	$16,960	$1.12	$931	-	$ 53	-0-	$ 483	$ 95	$ 57	$ 17	$ 6	$ 10	$179	$ 31	-0-	-0-	$16,960	$17,891
12-16-51	$18,769	$1,054	$13,611	$ 3,211	$16,822	90%	$17,876	$1.12	$893	-	$ 41	-0-	$ 517	$ 123	$ 15	$ 13	-0-	$ 17	$167	-0-	-0-	-0-	$17,876	$ 18,769
12-23-51	$18,120	$ 910	$13,113	$ 3,210	$16,323	92%	$17,233	$1.11	$887	-	$ 70	-0-	$ 475	$ 111	$ 9	$ 51	-0-	-0-	$ 115	$ 56	-0-	-0-	$17,233	$ 18,120
12-30-51	$19,492	$ 879	$13,091	$ 3,500	$16,591	85%	$17,470	$1.17	$1,322	-	$ 40	$ 700	$ 380	$ 93	$ 31	$ 11	$ 7	$ 3	$ 77	-0-	-0-	-0-	$17,470	$ 19,492
1-6-52	$19,180	$1,013	$13,180	$ 3,570	$16,750	87%	$17,763	$1.15	$937	-	$ 37	$ 480	$ 470	$ 110	$ 60	$ 70	$ 23	$ 16	$ 40	$ 11	-0-	-0-	$17,763	$ 19,180
1-13-52	$18,076	$ 890	$12,990	$ 3,401	$16,391	91%	$17,281	$1.10	$795	-	$ 29	-0-	$ 400	$ 99	$ 30	$ 115	$ 19	$ 90	$ 13	-0-	-0-	-0-	$17,281	$ 18,076
1-20-52	$18,915	$ 750	$13,321	$ 3,397	$16,718	88%	$17,468	$1.13	$1,167	-	$ 20	$ 280	$ 73	$ 154	$ 27	$ 13	$ 74	$ 17	$ 31	$ 120	-0-	-0-	$17,468	$18,915

AVERAGE LOSS PER WEEK $ 1,433

SAVED

$6,305 $6,502 $6,590 $6,558 $5,411 $6,016 $ 638 $5,986

JP

- - -	=	ACTION TAKEN BY MANAGEMENT FROM WEEK-ENDING 11-25-51 ON
	=	DECIDED LINE ACTION RESULTED IN SPECIFIED SAVINGS

SAVINGS FOR 8 WEEKS FOLLOWING LINE ACTION	P.R.W.E.	$ SAVINGS
	12-2-51 THRU- 1-20-52	$49,954

Figure 1

DELAY TO TOTAL VARIANCE DOLLARS

The total variance dollars minus waiting time dollars (lost time dollars) minus overtime dollars minus loss condition dollars

WAITING TIME DOLLARS

The lost time dollars (due to lack of work, etc.)

OVERTIME DOLLARS

The overtime premium dollars which are applied to the measured base dollars plus the premium or bonus adjustment dollars.

WORK DOLLARS

The actual work received expressed in dollars.

PAY DOLLARS

The actual paid dollars for work received.

THE STATISTICAL CURVE FOR CONTROL ACTIVITY

From an Industrial Engineering point of view Labor Cost Control means proper tooling, machine loading schedules, proper plant layout, methods time measurement, minimum rework, standard machine conditions, maximum incentive job measurement and on time deliveries to consumers. Briefly, we may conclude that proper Direct Labor Cost Control means production efficiency and sufficient margin of yield in profit to the manufacturer. For general action management may choose to plot a curve to determine the percent of loss dollars to the total direct labor dollars as shown in Figure 12. This curve may be plotted as shown or in any manner determined by the reader. It should be remembered however that the curve may present only a trend which must be evaluated by the producer. If for example, the producer has been absorbing the cost of a variance or deviation by adding a given figure to the sales cost price of his product he may find that the said figure was too high, too low, or correct. Based upon the factor of probability however we may further conclude that the normal or trend range for all loss factors will reach given predictable points as the cost per standard dollar approaches a one to one ratio.

The above procedure may be applied to all manufacturing units or departments. After sufficient readings have been taken, some attempt may be made to plot the trend which may serve to direct the producer. Management may then direct its efforts to adjust extreme deviations whenever they arise. A detailed analysis may reveal for example, that Machine and Tool conditions have caused a marked deviation from the anticipated standard cost. The producer may, with adequate cost control information at his service, seek an immediate remedy from responsible line supervisors.

SPECIFIC JOB ANALYSIS

Whenever it becomes necessary for the producer to determine the specific causes for cost variances resulting from a given job he may use the form presented (See Figures 13-14) to tabulate all pertinent job information. With this procedure,

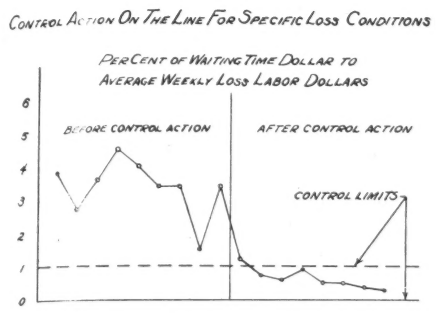

CONTROL ACTION ON THE LINE FOR SPECIFIC LOSS CONDITIONS
PER CENT OF WAITING TIME DOLLAR TO AVERAGE WEEKLY LOSS LABOR DOLLARS
BEFORE CONTROL ACTION
AFTER CONTROL ACTION
CONTROL LIMITS

Figure 2

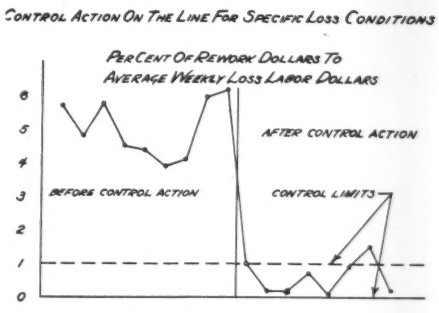

CONTROL ACTION ON THE LINE FOR SPECIFIC LOSS CONDITIONS
PER CENT OF REWORK DOLLARS TO AVERAGE WEEKLY LOSS LABOR DOLLARS
BEFORE CONTROL ACTION
AFTER CONTROL ACTION
CONTROL LIMITS

Figure 6

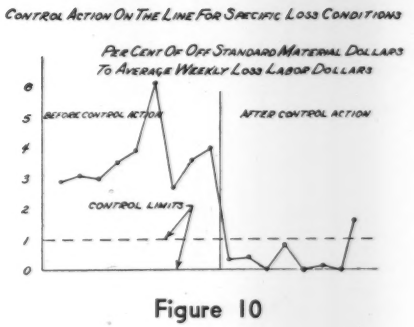

CONTROL ACTION ON THE LINE FOR SPECIFIC LOSS CONDITIONS
PER CENT OF OFF STANDARD MATERIAL DOLLARS TO AVERAGE WEEKLY LOSS LABOR DOLLARS
BEFORE CONTROL ACTION
AFTER CONTROL ACTION
CONTROL LIMITS

Figure 10

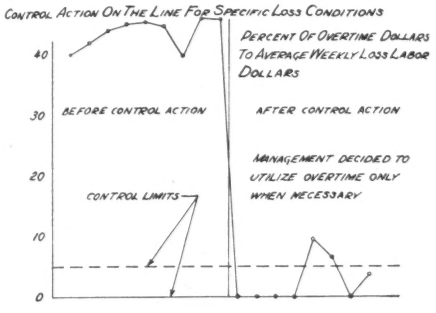

CONTROL ACTION ON THE LINE FOR SPECIFIC LOSS CONDITIONS
PERCENT OF OVERTIME DOLLARS TO AVERAGE WEEKLY LOSS LABOR DOLLARS
BEFORE CONTROL ACTION
AFTER CONTROL ACTION
MANAGEMENT DECIDED TO UTILIZE OVERTIME ONLY WHEN NECESSARY
CONTROL LIMITS

Figure 3

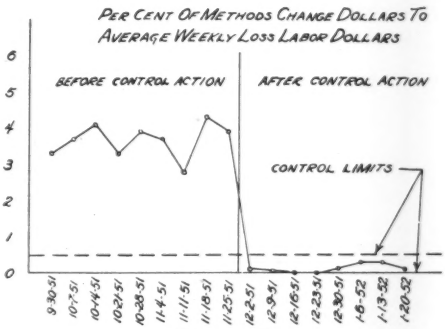

PER CENT OF METHODS CHANGE DOLLARS TO AVERAGE WEEKLY LOSS LABOR DOLLARS
BEFORE CONTROL ACTION
AFTER CONTROL ACTION
CONTROL LIMITS

Figure 7

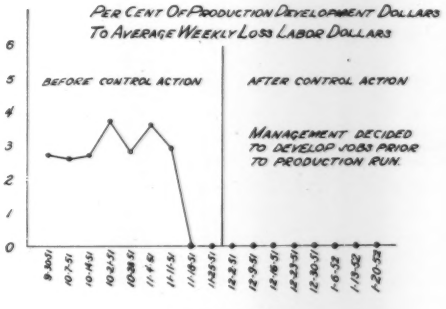

PER CENT OF PRODUCTION DEVELOPMENT DOLLARS TO AVERAGE WEEKLY LOSS LABOR DOLLARS
BEFORE CONTROL ACTION
AFTER CONTROL ACTION
MANAGEMENT DECIDED TO DEVELOP JOBS PRIOR TO PRODUCTION RUN.

Figure 11

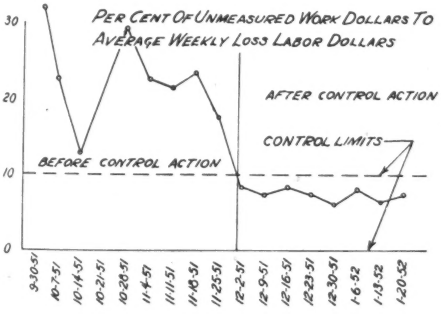

PER CENT OF UNMEASURED WORK DOLLARS TO AVERAGE WEEKLY LOSS LABOR DOLLARS
BEFORE CONTROL ACTION
AFTER CONTROL ACTION
CONTROL LIMITS

Figure 4

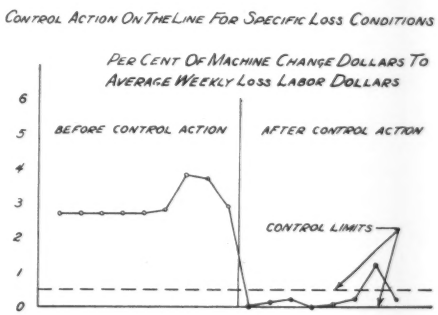

CONTROL ACTION ON THE LINE FOR SPECIFIC LOSS CONDITIONS
PER CENT OF MACHINE CHANGE DOLLARS TO AVERAGE WEEKLY LOSS LABOR DOLLARS
BEFORE CONTROL ACTION
AFTER CONTROL ACTION
CONTROL LIMITS

Figure 8

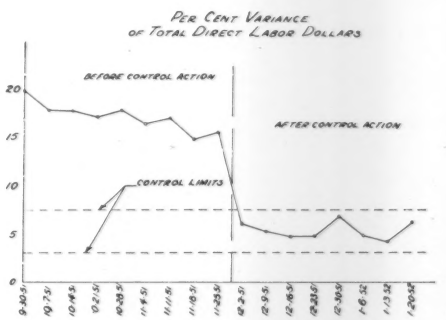


Figure 12

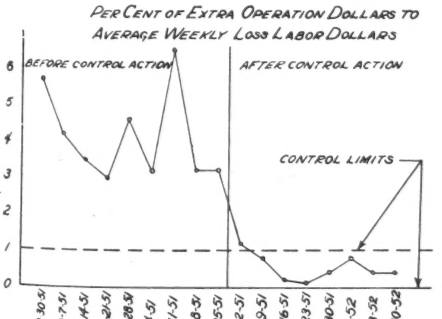

PER CENT OF EXTRA OPERATION DOLLARS TO AVERAGE WEEKLY LOSS LABOR DOLLARS
BEFORE CONTROL ACTION
AFTER CONTROL ACTION
CONTROL LIMITS

Figure 5

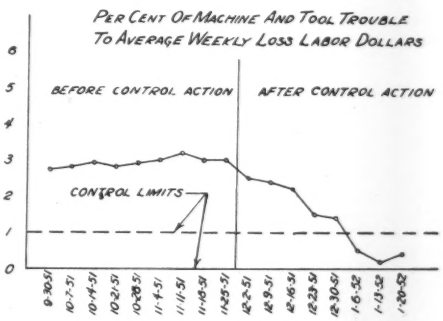

PER CENT OF MACHINE AND TOOL TROUBLE TO AVERAGE WEEKLY LOSS LABOR DOLLARS
BEFORE CONTROL ACTION
AFTER CONTROL ACTION
CONTROL LIMITS

Figure 9

the manufacturer will be able to discover the exact cause for a labor cost in excess of the standard cost which may be predetermined through a system of incentive measurement (Time Study) or standard cost estimating or both. Again, line responsibility in the production organization may assume its proper function in the endeavor to produce efficiently. In effect, the actual job report should result in line activity by Department or Unit Supervisors, Section Supervisors, Set-Up Men, and Operators.

COST VARIANCE ANALYSIS
(Non-measured jobs with cost variance exceeding _____)

Dept. X
Work Center 20
P. R. WK. End. 9-30-57

Drawing Number	Order Number	Part Title	Oper. No.	Operation	Emp. No.	Pcs. Comp.	Act. Hrs.	Est. Oper. Time (Hrs.) @60PH	Actual @ PH	Excess Cost ($Variance)
2411	01-52	SCALE	2	PRINT	200	8	2.5	1.70	18.70	$ 4.59
2413	03-12	SCALE	4	MOUNT	311	2	.5	7.00	15.00	$ .67
2412	07-30	SCALE	2	PRINT	200	30	.8	1.30	1.60	$ .97
2415	11-39	SCALE	2	PRINT	200	55	2.8	1.70	3.05	$ 3.32
2416	17-40	SCALE	4	MOUNT	311	7	.9	8.60	7.40	$ .15
3709	13-11	POINTER	1	MOUNT COMPLETE	9170	33	2.3	8.00	4.18	$ .22 CREDIT
3700	7-33	POINTER	2	MOUNT CAP	800	4	1.2	8.00	18.00	$ .89
4716	00-47	SOCKET	5	DRILL AND C'SINK	301	87	6.9	4.00	6.82	$ 5.26
4719	00-10	SOCKET	5	DRILL AND C'SINK	301	27	3.0	4.00	6.66	$ 3.17
4715	01-9	SOCKET	5	DRILL AND C'SINK	301	83	13.2	4.00	9.54	$ 15.94
33331	31-11	FRONT	3	SET UP AND ENGRAVE	100	2	2.2	29.00	66.00	$ 3.73
122574	4-3	COVER	4	SET UP AND DRILL	291	2	1.0	25.00	30.00	$ 1.66

Figure 13

COST VARIANCE ANALYSIS
(Taken from Advance Release of Standard form)

Dept.
P. R. Wk. End. 9-30-51

		Work Center 1 Lg. Press		2 Sm. Press		3 Milling		4 Drilling		5 Grinding		6 Lathe		7 Soldering		Totals	
		No.	Amt.	No.	Amt.	No.	Amt.	No.	Amt.	No.	Amt.	No.	Amt.	No.	Amt.	No.	Amt.
R.S. Orders	PF	37	$64.56	6	$2.93	14	$66.05	32	$371.59	22	$79.32	11	$75.05	13	$44.22	135	$703.72
	IPF	8	$69.50	6	$9.18	4	$15.50	6	$15.05	4	$51.63	3	$11.23			31	$172.09
	Sup.							4	$19.65			1	$10.00	3	$15.76	8	$45.41
S - Orders	PF	8	$23.55			6	$8.08	3	$7.27	7	$12.56	14	$77.76	46	$223.89	84	$353.11
	IPF													6	$104.05	6	$104.05
	Sup.													3	$3.66	3	$3.66
Added Oper.	PF	9	$18.81			1	$10.23			3	$1.93	1	$0.75			14	$31.72
	IPF	4	$24.16	2	$1.72							1	$4.95			7	$30.80
	Sup.																
Rework	PF	2	$4.24	1	$1.70	5	$32.97	4	$27.69	3	$24.01	1	$32.64	5	$54.53	21	$187.80
	IPF			1	$1.06			1	$12.75							2	$13.81
	Sup.																
Method Chg.	PF			2	$1.12											2	$1.12
	IPF			1	$3.34	1	$13.02					1	$6.53			3	$22.89
	Sup.							4	$31.21			1	$5.70	2	$10.44	7	$47.35
Mach. Troub.	PF																
	IPF																
	Sup.	1	$3.00													1	$3.00
Off-Std.	PF																
	IPF																
	Sup.							1	$3.81							1	$3.81
Prod. Dev.	PF							3	$17.50							3	$17.50
	IPF							2	$5.56			1	$1.73			3	$7.29
	Sup.																
Totals	PF	56	$11.16	9	$5.75	26	$117.33	39	$424.85	35	$127.82	27	$186.20	64	$322.66	256	$1294.97
	IPF	12	$93.66	10	$15.30	5	$28.52	7	$33.36	4	$51.63	5	$22.68	6	$104.05	49	$349.25
	Sup.	1	$3.00						$0.36			2	$15.70	8	$29.86	12	$99.42

LEGEND
R.S. Orders—Regular standard order.
S. Orders—Special order.
P. F.—Performance factor—average paid earnings—maybe day-rate.
I.P.F.—Initial Point Hour Factor paid at average earnings until job standard time is applied.
Sup.—Supplementary payment—payment above standard time cost.

Figure 14

THE FINAL ANALYSIS — UNIT OR DEPARTMENT EFFICIENCY CURVE

In the final analysis the producer may keep his line supervisors informed on the facts concerning the efficiency of each unit or department. Figure 15 may serve to show the percent of loss dollars to total direct labor dollars spent for a given unit. Further, a curve may also be plotted to show the cost per standard dollar for each payroll week. Efficiency in this case will be determined by the increase or decrease in the cost per standard dollar. Maximum unit or department efficiency is theoretically achieved when one dollar paid is equivalent to one standard hour dollar of work interpreted in terms of effort and achievement. A composite unit or department efficiency report may further serve to instill a sense of friendly competition between line supervisors. It must be remembered, however, that all phases of engineering, and more graphically Industrial Engineering, according to Victor Short have as their foundation the grandfather of all engineering, that being Human Engineering.

ACTUAL OPERATION

The Direct Labor Cost Control Program presented herein is actually in operation. A saving of $49,954 dollars has been affected in one manufacturing department during the first seventeen weeks of Cost Control activity. For obvious reasons the writer is unable to publicize the name of the manufacturer for whom Cost Control has brought production efficiency at decreased costs.

Prior to the inception of specific control action through line personnel, management plotted its loss conditions to indicate trends and thereby establish acceptable control limits as shown on the Control Charts. Once control limits or ratios have been established every possible effort was made by responsible line personnel to maintain the limits. The establishment of control ratios or limits by management along with decided action to maintain them has resulted in an average weekly saving of $6,244 for one manufacturing department spending approximately $21,000 for Direct Labor for the period specified. It may be well to remind the reader that nine of the seventeen weeks mentioned in the open-

ing paragraph served only to show the prevailing cost trend upon which the following eight weeks of control activity was based. The $49,954 saved, therefore, was based upon direct management action from the ninth through the seventeenth week. All control limits are based upon management's decision to add a predetermined figure, based upon known efficiency performance, to the selling price of its items.

The system described herein has been in use for approximately one year. Management did not have the specific loss cost facts and figures to guide its decisions prior to this present activity. Haphazard decisions covered by large profit

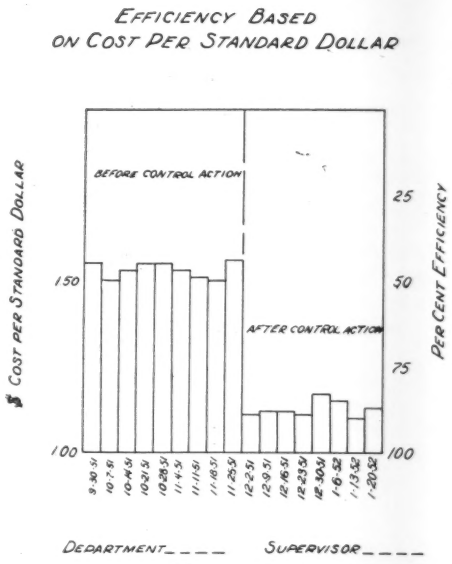


Figure 15

on items sold in a non-competitive market soon fell victim to an era of producer competition. Efficiency became the key-note of survival as the manufacturer began to price his items out of any feasible competitive market. All control information may be in the hands of management just as soon as the clerical force computes and tabulates same or immediately following the entire accumulation of all department or unit figures. Trends may best be plotted from accumulative figures, while line supervisors may perform their control functions on the production line as the actual loss conditions present themselves. We must remember however, that only the sincere desire and thereby determination of management to control its direct labor cost will bring about the results described.

Don F. Copell

Don Copell's many friends and followers will be interested to know that he edited this August issue of ADVANCED MANAGEMENT. Despite his many and varied responsibilities he found time to assume this additional temporary assignment for the Society.

Mr. Copell founded and for many years edited *Modern Management.* Under his leadership this Society publication achieved national and international recognition in the field of industrial management. Since its merger with ADVANCED MANAGEMENT he has continued to play an active part as a member of the Board of Consulting Editors working closely with the editorial staff. His wide contacts throughout industry have brought to ADVANCED MANAGEMENT many outstanding articles.

For the 1952-1953 year Mr. Copell is serving as Vice President-Charge of Membership, His associates in SAM are confident he will be as successful in this important Society activity as he has been in the past in his other Society activities. He has been President and National Director of the Northern New Jersey Chapter of SAM. He has been one of the major factors in the continued growth and development of this Chapter. He serves as Vice President of Engineering and Training at the Wagner Baking Corporation of Newark, New Jersey.

As a result of his extensive industrial and Society experience, Mr. Copell is in wide demand as a speaker before our chapters and other management organizations. For many years he has played a major role in the planning and conduct of SAM Conferences.

MEETINGS OF NATIONAL OFFICERS

Sept. 20, 1952 ....Executive Committee
Nov. 1, 1952 .....Board of Directors
Feb. 7, 1953 .....Executive Committee
April 18, 1953 ....Board or Directors
May 16, 1953 ....Executive Committee
June 27, 1953 ....Board of Directors

GRAND TOTAL OF MONTHLY ANNUAL POINTS CHAPTER PERFORMANCE AWARD PLAN 1951 - 52

Chapters	Total Monthly Points Awarded	Total Annual Points Awarded	Grand Total
Washington	3327	604	3931
Greensboro	2496	1041	3537
Pittsburgh	2527	986	3514
Allentown	2071	1291	3369
Hudson Valley	2225	586	2811
Milwaukee	2093	701	2794
No. New Jersey	2061	574	2635
Boston	1650	562	2212
Detroit	1414	589	2003
New Brunswick	1690	310	2000
Baltimore	1409	590	1999
Montreal	782	1172	1954
Chicago	1529	373	1902
Trenton	1542	360	1902
Atlanta	849	1000	1849
Philadelphia	1358	308	1666
Wilmington	1336	171	1507
Indianapolis	991	438	1429
Cleveland	987	305	1292
Central Penn.	885	300	1185
Cincinnati	634	381	1015
Lancaster	563	454	1017
Dayton	632	348	980
St. Louis	687	271	958
Richmond	654	296	950
Los Angeles	855	88	943
Bridgeport	548	375	923
Worcester	585	325	910
Asheville	887	20	907
San Francisco	693	88	781
Columbus	351	401	752
Western Mass.	369	363	732
Wilkes-Barre	40	610	650
Portland	502	135	637
Dallas	402	260	608
Birmingham	492	75	567
Louisville	394	117	511
Manchester	322	185	507
Central New York	315	132	447
Providence	289	108	397
New Orleans	290	30	320
New Haven	195	96	291
Hartford	172	66	238
Twin City	30	206	236